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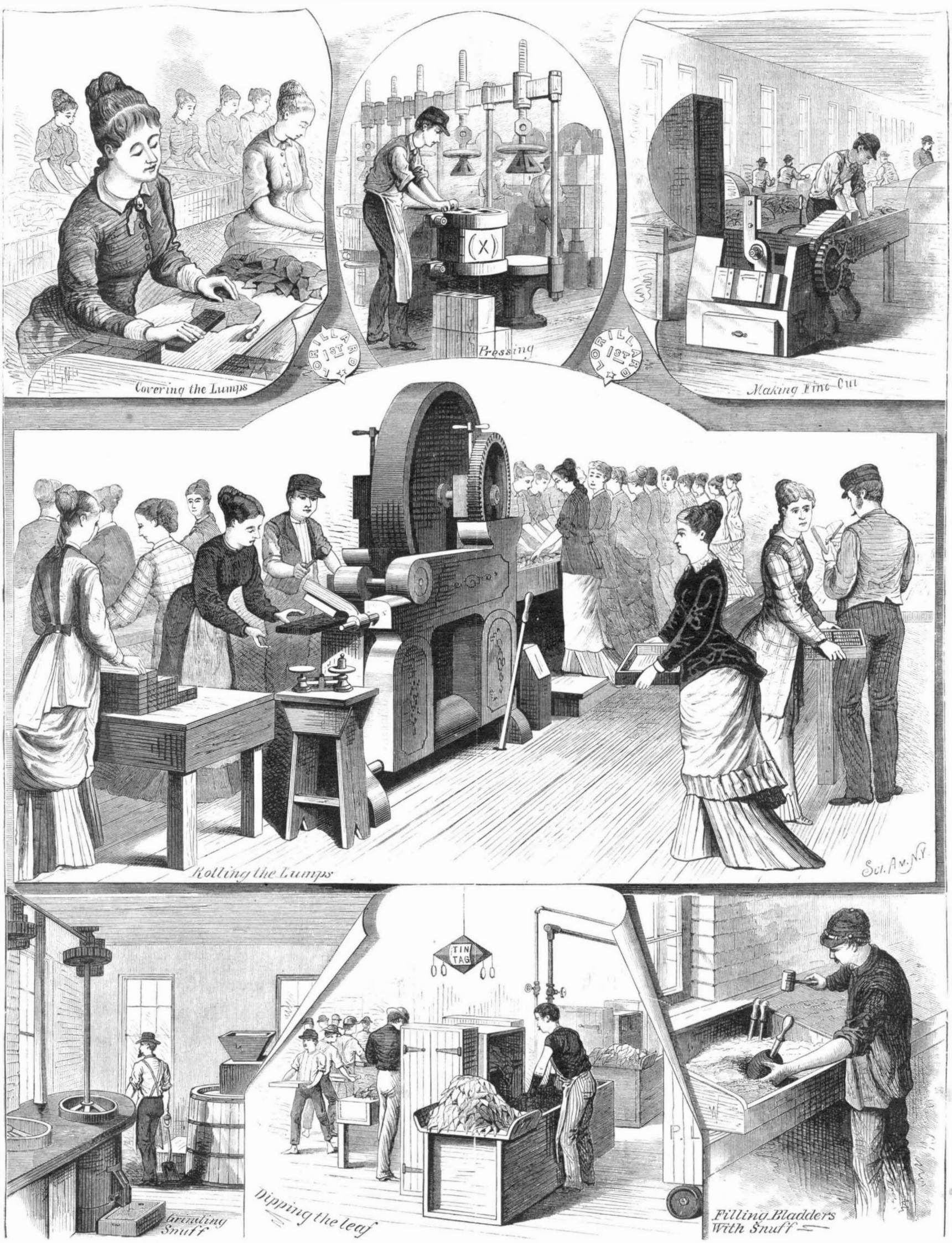

LORILLARD'S TOBACCO FACTORY.—[See page 17.]

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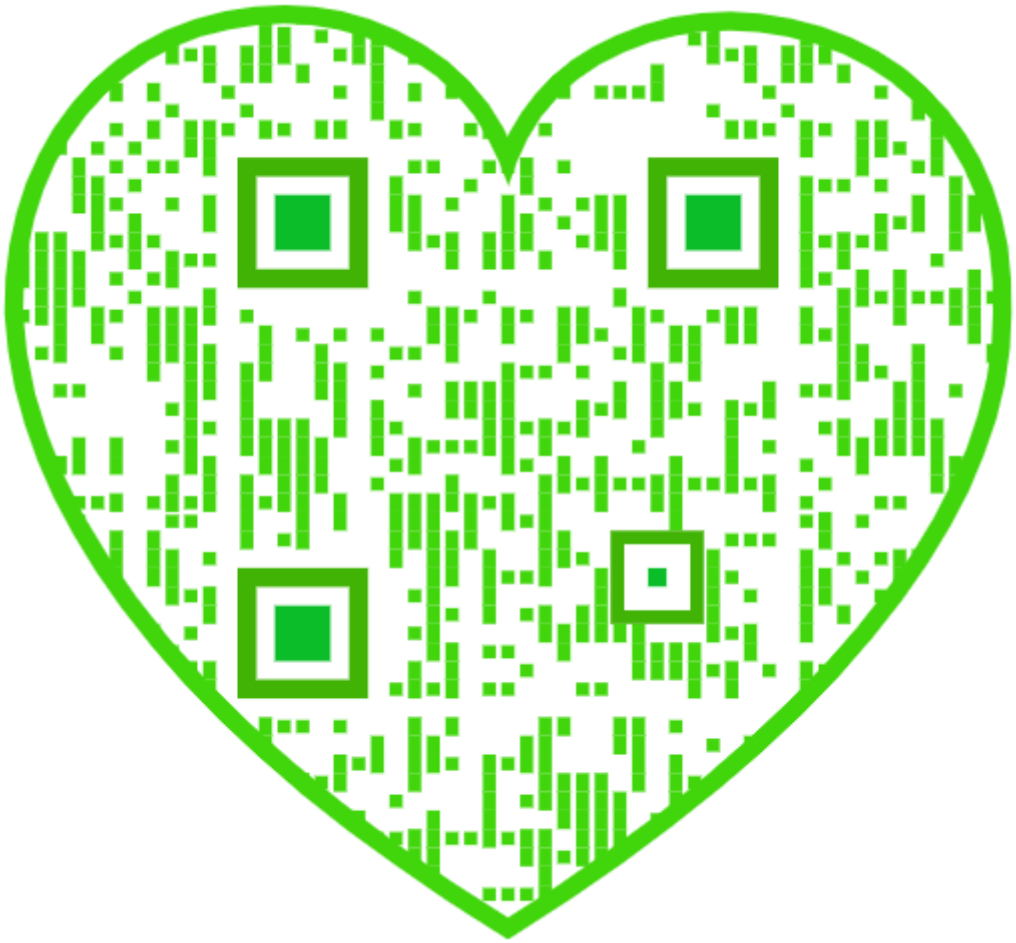

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How to Remove Stains and Grease Spots from Linen, Cotton, Woolen, and Silk Goods. Table giving at a glance the Proper Method of Removing Glue, Grease, Varnish, Paint, Fruit and Wine Stains, Ink, and Iron rust, Coal Tar, and Acids.—Waterproof Paper and Ink for Documents.

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V. NATURAL HISTORY, GEOLOGY, ETC.—Recent Arctic Explorations. Map of the Northern coasts of Europe and Asia, showing the navigable route from Norway to Japan, discovered by Professor Nordenskjold, with a narrative of his three voyages in the Arctic sea.

VI. ARCHÆOLOGY.—Peruvian Antiquities. By E. R. HEATH. Remarkable ruins and walls. Pizarro's prison. The wonderful huacas. The gold records of Truxillo. Immense burying grounds.

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A REMEDY WORSE THAN THE DISEASE.

Senator Windom's direct assault upon the patent system as a whole proving a hopeless failure, he returns to the charge in an amendment for the encouragement of infringers. It provides that no recovery of damages or costs shall be had against the defendant in any suit brought for the alleged infringement of a patent by the use of any patented device, process, invention, or discovery, if it shall appear that the defendant purchased the same for his own private use from the manufacturer thereof or from a dealer engaged in the open sale of the same, unless it shall also appear that the defendant at the time of such purchase had knowledge or actual notice of the existence of such patent, but this provision shall not apply to purchasers from foreign manufacturers or dealers.

Senator Booth very pertinently argued that, by the terms of the constitutional provision with respect to patent rights, Congress was empowered to grant to inventors and authors only "the exclusive right" to their respective writings and discoveries; and asked: "Now, how can that be an exclusive right if Congress says by law that a person other than the inventor may use the invention and not be liable in damages? A patent is as much property in the hands of its owner as a horse or an ox. From its incorporeal nature it is impossible to punish its piracy by criminal law as you do the larceny of personal property. The committee were unanimously of opinion that the inventor would be stripped of all his security if he were not allowed to follow the patented thing wherever he could find it, not that he might bring vexatious and annoying suits against every one who might innocently use a device, but in order that he might cut off the market against a piratical manufacturer."

Further on Mr. Booth said: "The amendment offered by the Senator from Minnesota says that an infringer in certain cases shall not be liable to damages unless he had actual notice of the existence of the patent. Of course that destroys the remedy in all those cases, for it is absolutely impossible that the patentee should know who is going to use his patent or that he should give notice to everybody. In the case of great manufacturing companies and railroad corporations, to whom is notice to be given? Then, as to the word 'knowledge' in the amendment, we know how hard it is to bring knowledge home to an individual, especially where 'ignorance is bliss.' But how can you bring knowledge home to a corporation that has no soul to receive it? Inventions, as has been said before, are nearly all the work of laboring men, men who toil with their hands. In that field they seek the prizes of life and receive their patent of nobility. Under the amendment of the Senator from Minnesota these achievements of these toiling men may be absorbed by manufacturing companies and railroad corporations who simply choose to close their doors to the truth and shut their eyes to the light. Under this theory the best patent adviser of a corporation or a manufacturing company would be the lawyer who knew the least law and would always advise his clients that there was no existing patent.

"But the loss does not fall, as I have indicated, chiefly upon inventors, great as that is; but by removing the incentive to invention you dry up the very spring at its source."

The mischievous tendency of Mr. Windom's amendment needs no more forcible illustration. It is but another attempt to prevent a local and limited wrong by wholesale injustice to many. There is not an existing institution which may not be and has not been made the instrument or the excuse for wrong doing. Shall we abolish our courts because judges have been incompetent and juries corrupt? Or the church because it has been used as a cloak for rascality? Equally unwise would it be to abolish the inventor's right to his own, because a morally innocent user of a patented article may possibly suffer wrong through the misconduct of another. That in Minnesota and elsewhere men have misused the provisions of the patent law for blackmailing operations, no one will deny. Possibly such things can be prevented by an amendment of the law, which shall not at the same time open the door for the admission of greater wrongs. If so, the country would be glad to see it done. But neither country nor Congress, we believe, will assent to any remedy so much worse than the disease as that proposed by Mr. Windom.

A PLAN OF CO-OPERATIVE CHARITY.

There are two classes of people who need and should have assistance: first, those who, through physical incapacity, are unable to provide for themselves wholly or in part; second, those who are able and willing to work, yet are without employment. The first class includes orphan children and aged people having no friends or relatives able to care for them, the sick, the crippled, and the like. These need the assistance of the charitable, and it should be given kindly, and as abundantly as the means of the charitable may justify. The second class includes some in temporary want from accidental causes, and vastly more chronically in want through incapacity to compete with average workers in point of skill, intelligence, or endurance.

Is it not possible to employ the latter class to their own advantage, and at the same time as a means for providing more comprehensively for the wants of those that are entirely helpless—this, too, without diminishing in the least the productive value of the labors of others?

Call the two classes respectively A and B. Charity says that B should be provided with work according to the individual capacity of its members. To furnish that work requires capital and supervision, which under the circumstances must be provided without charge. Obviously it will not do for charity to provide work beyond the demands of trade and at the same time pay the market rate of wages to the incompetent. That would hurt the self-supporting classes certainly by diminishing the value of their labor, possibly, also, by seriously diminishing the demand for labor. For the regular manufacturer to compete in the open market with the products of organizations charging nothing for capital or supervision would be impossible except by paying his workmen less or working them harder, neither of which would be a satisfactory result of charity. On the other hand, it would utterly destroy the beneficence of the nominally charitable labor organizations, if the slightest suspicion could arise that the managers of it were speculating on the necessities of the poor.

There are in any community, say, one thousand men and women of class B. They are out of work, and there is no demand for their labor. Yet they would be glad to do anything for the time to gain an honest support. They will work for half the usual rate of wages rather than waste their time in idleness or be an absolute burden upon the charitable; and it is infinitely better for them and for the community that they should be so employed in default of something better.

There are in the same community a larger or smaller number of class A, whose wants are now meagerly supplied by charity. At present the larger part of them affect but imperceptibly the market for food, fuel, clothing, and the like. They simply go without, and to a considerable extent the members of class B fall under the same rule.

Now we believe it quite possible, without adding to the already heavy burden upon the charitable, save in organization and direction, also without materially affecting the status of the self-supporting workers of the community, to make work for the unemployed, for the better supplying of the needs of both A and B. In this way. Provide productive occupation for the unemployed; pay for such work all that it is worth; and use the products of it exclusively for charitable purposes. So far as possible let the inmates of all asylums, hospitals, and the like be clothed by the labor of those employed by charity. In like manner let those furnished with employment have the benefit of the products of charitable workshops. Also, so far as possible, let all outdoor assistance be drawn from the same stores.

For example: A sewing woman is out of work. True charity would set her to work for pay. But it will not do for organized charity to furnish the needed work and pay the same for it as is received by the sewing woman who finds work for herself. Nor would it do to pay less and throw the cheapened product upon the market to compete with the unassisted work of the self-supporting. But by means of the furnished work charity might secure, with a given outlay of money, a double good—employment for the unemployed, and a larger bounty for the helpless. And it would also furnish a suitable means for sifting out from the deserving poor the lazy and undeserving. The wider the association of such charity workshops the wider the range of employment that might be furnished, and the greater the aggregate benefit. And by means of them willing workers out of work through the natural operations or misfortunes of trade would run no risk of pauperism; and at the same time their limited pay might be made to go much further than otherwise in supplying their necessities, without cheapening in the least the value of independent labor.

MISS HOSMER'S MOTOR.

The controversy between Miss Hosmer and Mr. Chapman with regard to the magnetic motor which both claim as their own has developed one fact of considerable interest. It comes out in an interview with her which Mr. Louis J. Jennings reports to the *World*. To prove the futility of Mr. Chapman's claim, Miss Hosmer said that the model which that gentleman was at work on in London "is and has always been entirely worthless. Nothing whatever can be done with it or made out of it. It is on the wrong principle altogether; and, indeed, it is only within the past fortnight, in this very house, that I hit upon the expedient by which the difficulties that have puzzled me could be overcome. Thus, although Mr. Chapman claims the invention, he is ignorant at this moment of the only mode by which it can be turned to practical account. He has claimed the discovery before it was perfected. The means of surmounting all obstacles occurred to me only the other day, and you would see the truth and importance of what I am saying to you if I could reveal the secret to you."

There is a frankness in all this which is inexpressibly charming. Seeing, however, that the model in question—a "worthless" thing, "on the wrong principle altogether"—was confidently described by both Miss Hosmer and Mr. Chapman, not to speak of the *Post's* correspondent, as the most wonderful invention of the age (not excepting the Keeley motor), the cautiously minded may well be excused for not throwing up their hats until the new expedient is proved to be really better.

MEAN DISTANCE OF WATER MOLECULES.—Hermann Herwig concludes that no two molecular layers in water can be more than 1·86 of a millionth of a millimeter apart, and that the same is true with regard to the mean distances of adjacent molecular centers. Sir Wm. Thomson had previously estimated the least value of the same distances at 0·05 millionths of a millimeter. These two estimates, one being less than four-fold the other, furnish satisfactory approximations to the true value.—*Ann. der Phys. u. Chem.*

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THE FIRST ELECTRIC LAMPS.

There seems to be little doubt but that Professor Moses G. Farmer, at present connected with the torpedo station at Newport, was the first to make successful experiments with the electric light in this country, and that his discovery dates as far back as 1859. A correspondent of the New York *World* communicates to that paper a recent interview with Professor Farmer, which he commences with the following extract of a letter, written by the Professor some time since to a gentleman in Salem, Mass.:

"Some few of the citizens of Salem (among them ex-Mayor Williams, Mr. George D. Phippen, Mr. J. H. Phippen, and perhaps others) will doubtless recollect a parlor at No. 11 Pearl street, Salem, Mass., which was lighted every evening during the month of July, 1859, by the electric light, and this electric light was subdivided too! This was nineteen years ago, and it was undoubtedly the first private dwelling house ever lighted by electricity. A galvanic battery of some three dozen six-gallon jars was placed in the cellar of the house, and it furnished the electric current, which was conveyed by suitable conducting wires to the mantelpiece of the parlor, where were located two electric lamps on each end of the mantelpiece. (I would not wonder if the screw holes were there at this day.) Either lamp could be lighted at pleasure or both at once by simply turning a little button to the right for a light, to the left for a dark. No matches, no danger, no care to the household, nor to any one except to the man who attended to the battery. The light was noticed as being soft, mild, agreeable to the eye, and more delightful to read or sew by than any light ever seen before. Its use was discontinued at that time for the simple reason that the acids and zinc consumed in the battery made the light cost about four times as much as an equivalent amount of gas light."

Professor Farmer was requested to give his views—first, upon the gas company scare; second, as to the merits of the electric light; third, regarding the mode of conducting it through the public streets; fourth, as to its cost; fifth, regarding the production of electricity.

Speaking of the scare in the gas stock market, the Professor said he thought it was certainly premature, for at present there was not more than one hundred electric lights in practical use throughout the land, and, compared with the number required for the illumination of the country, they were as nothing. "Suppose," said he, "you wanted to give light to the citizens of New York, each one requiring equal to a 10-foot gas burner. Reckoning on the basis of 1,000,000 people you would want 10,000,000 candle lights. If you wanted it divided up into small lights you could not expect to get more than 500 candles per horse power, and that would require at least 20,000 horse power to light the city. In order to accomplish this there would have to be made machines, steam engines (to a large extent purposely for it), magneto-electric machines to furnish the electricity, and it would not be advisable to have them average more than 5,000 candles each for fear of getting out of repair. That would require 2,000 magneto-electric machines, which could not be produced in a moment. It would perhaps be desirable to have 5 electric lamps to each machine, and that would require at least 20,000 lamps.

"While some of the manufacturers are prepared to supply in a certain time their particular style of lamp, yet the public has not decided which is the best to use. No lamp at present in use has such manifest superiority that every person will buy that particular one. None at present in use is properly adapted to minute and profitable subdivision of the electric light. This is an entirely different condition of things to gas illumination, in that factories already exist, and the means of supplying gas fixtures, tubing and piping. Gas pipes are already laid in the streets, which would be utterly worthless for the distribution of electricity for the purposes of the electric light, and while competent electrical engineers are sufficiently well acquainted, theoretically and practically, with the distribution of electricity for telegraphic purposes, yet a distinct branch of electrical engineering science needs to be inaugurated and carefully studied before any expensive system of electric distribution should be entered upon; and although I expect to see the electric light widely introduced, and that very soon, yet I do not conceive that it is going to supplant and displace, to a very large extent, the consumption of gas immediately. But it may and doubtless will have the effect to stimulate and hasten the use of gas for heating purposes as well as those for illumination, and so I expect the consumption of gas to increase rather than decrease after the effect of the scare is over. I venture the opinion that in five years from now there will be more gas consumed than there is to-day, proportionately also with the increase of the population. One of the effects of the introduction of the electric light for the purpose of illumination will be the stimulating inventors to produce apparatus for the consumption of gas for heating purposes."

Touching the merits of the electric light, Professor Farmer said it would eventually approximate the quality of daylight for the display of goods and merchandise in warehouses. It would be vastly superior to gas for the illumination of workshops and manufactories, for with the same expenditure a better and greater diffusion of light would be obtained. He considered a room fairly lighted that has one candlelight to 125 cubic feet of space, very well lighted with one candle to 75 cubic feet of space, but with the electric light properly distributed it would be easy to have one candlelight to each forty or fifty cubic feet of space, and this would be accounted a very brilliant illumination. The light, he thought, would render great service in the mining regions, lessen the expense and diminish the dangers. It will render it perfectly feasible to carry on great enterprises by night as well as by day, such as tunnels, bridges, and constructive operations in general, and prove useful for billiard halls, which are lighted with difficulty by gas, and if necessary great agricultural operations could be carried on by night at profitable expense in harvest time. The lighting of streets and other public thoroughfares will be accomplished satisfactorily and at much less expense than the present mode of lighting by gas, and so there would be more illumination for less money; and a good street lamp at night is preferable to a policeman.

With reference to the mode of conducting electricity through the streets, the Professor said that copper wire was the cheapest conductor, and so will be universally used. The best mode of insulating wires underground for conducting electricity for electric illumination was as yet undeveloped, and will need careful investigation, because the frequent accidents to which subterranean wires are exposed will necessitate the having of a corps of electrical engineers for this special occupation or art, for while it is somewhat of the same character as conducting electricity for telegraphic purposes, still the conditions would be that of another department.

Regarding the cost where power is already in use for manufacturing purposes, and where there is an available surplus and it can be used for the production of the electric light, as at Fall River, Providence, Lowell, Manchester, Nashua, Cohoes (N. Y.), and multitudes of other places, the electric light can be furnished very much cheaper than gas is at present supplied, perhaps for from one quarter to a half the cost. There are two elements that enter into the cost of the electric light—the cost of the power consumed in producing it, which costs only when used, and the cost of interest on the plant, which is as great when not in use, for it, like a blister, draws all night long. So if the light is only to be used for an hour or two the cost of interest and depreciation might exceed the cost of the power consumed. For instance, the horse power in some cases could be furnished at $70 per year, while the interest and depreciation on a 5,000 candle machine might cost as much more. So if the light is to be used but a small portion of the time, it would be relatively considerably more expensive than if required to be used all the time. The cotton manufactory would be at one extreme and the coal mine at the other.

Of the production of electricity, Mr. Farmer said that it cannot be stored and the storehouse drawn on at pleasure. It must be produced as and when wanted. The electricity for the purpose of illumination is produced by the movement of coils of copper wire in the neighborhood of magnets. Electricity is developed in condition whenever it is moved across the lines of force streaming from a magnet. The electricity is more powerful the more rapid this motion; more powerful the longer the wire, and more powerful the greater the intensity of magnetism in the magnet. These are the fundamental facts that underlie the construction of all magneto-electric machines. Any more technical description of the process of producing electricity would scarcely be understood by the general reader. In concluding the interview, Mr. Farmer said: "While our gas stocks have depreciated, and may not, possibly, return to their former value, I do not look to see the companies cease to pay good, fat dividends."

AMERICAN INDUSTRIES.—No. 1.

BY HAMILTON S. WICKS.

It is proposed, in this series of articles, to give a concise and intelligent description of the leading industries of this continent. Those situated near, and holding immediate relation with the commerce of the metropolis, will be first considered. Just opposite this city, and immediately dependent on it, lies Jersey city, a workshop of the metropolis of no little importance. Its shipping interests are large, and it is the site of such extensive manufacturing industries as Lorillard's Tobacco Works, The Dixon Crucible Co., Colgate's Soap Works, extensive sugar refineries, iron and steel works, etc. etc.

The first of these industries we illustrate and describe is the Lorillard Tobacco and Snuff Manufactory, and an engraving illustrating some of the processes is shown on the first page.

HOW TOBACCO AND SNUFF ARE MADE.

Since the reign of William III. of England the use of tobacco has become a universal custom throughout the civilized world, although long before his time it had been used quite extensively, having been originally introduced to the attention of European colonists by the Aborigines of this country. Many of the most profound thinkers have been inveterate smokers, chewers, and snuffers; and not a few have lived to an advanced old age with the pipe, snuff and tobacco box as their constant companions.

The tobacco industry of America is a very important one. It utilizes the soil of large tracts of land in many Southern and Western States. It gives employment to hundreds of thousands of people, both in the field and in the factories. It interests large aggregations of capital, and pays into the national treasury fully 34 per cent of the internal revenue.

For the full illustration of this industry it would be necessary to visit some of the quaint villages of Virginia and Kentucky, such as Lynchburg or Henderson, where about this season of the year the planters bring in to market their wagon loads of tobacco leaf, where the speculators or "pinhookers" (as they are called) barter with them for its sale in lump, and where the old time negroes stationed on every corner with long "tobacco horns" call the merchants to the commission sales at the different warerooms. This portion of the industry, as well as the tedious culture of the leaf on the plantations, is merely initiatory, though none the less interesting and useful. The most complicated, and also very interesting and important part of the industry is the manufacturing of the leaf into the various grades of chewing, smoking, and snuffing tobacco that the market demands.

The illustrations on the first page of interior views of P. Lorillard's extensive tobacco factory will prove interesting, as showing the different processes of manufacture. The reader must understand that the leaf used in large manufactories is selected with the greatest care by experts, who determine by the color and smell the quality requisite for any particular grade. The manufacture of plug tobacco is the most extensive in the Lorillard establishment. The machine in the illustration entitled "Rolling the Lumps," is the plug making machine, one of the most ingenious machines known to the trade and wholly controlled by the firm. After it has been sweetened, flavored, and dried the leaf is fed into this machine as "fillers." Being placed as evenly as possible in the long trough by girls it is pressed and cut into the exact size of plugs required by the wonderful automatic action of the machine. The illustrations showing the method of "Covering Lumps" and the "Pressing" give very accurate ideas of those processes. Each plug is weighed after coming from the plug machine, and a standard weight is obtained by taking from or adding to each before covering them. A broad handsome leaf is now wrapped by expert hands about the plug, and it is ready for the pressing room. Here the plugs are put into smooth iron "cells" within a large frame and submitted to powerful hydraulic pressure for several hours. A finishing pressure is afterward given them in another set of hydraulic presses called "pots." Each plug is stamped with the Lorillard tin tag, which is a guarantee of its genuineness.

For the manufacture of fine-cut chewing tobacco the same care in selecting the leaf is exercised as in the plug. The "Dipping of the Leaf" is shown in the illustration; a solution of licorice and sugar, etc., being used for the purpose, and on this and the quality of the leaf depends the character of the tobacco. After stemming the leaf, it is taken to the cutting room, shown in the illustration entitled "Making Fine-cut." Here it is arranged in a trough and forced by the endless chain through a small square aperture, where it is cut into long silken threads by a powerful knife, which makes 1,200 revolutions per minute. All that now remains is to dry and prepare it for the market. Smoking tobacco is similarly made.

In the manufacture of snuff time is required. The process of fermentation lasts from six months to a year or more. Before going into the grinding mills, shown in the illustration, it is thoroughly cured, and after being ground and before it is filled into the bladders for sale it is again cured, until its fragrance and mildness are of the most approved quality. The factories of the Lorillard tobacco works occupy a full block, 405 feet in length and 210 feet in width, in Jersey City, N. J., and bounded by Washington, Warren, Bay, and First streets, and nearly the whole of another block in addition. The house has an age of 118 years, having been originally founded in 1760 by Pierre Lorillard, a French Huguenot. In the year 1870 the present firm took control of affairs, with Mr. Charles Siedler as general partner. The factory in Jersey City as it now stands was erected in 1875, and is the largest institution of the kind in the world. Last year the sale of plug tobacco exceeded 10,000,000 pounds. Of tobacco and snuff the sales aggregated more than 14,000,000 pounds, and $3,500,000 revenue tax was paid to the Government. There is no State in the Union, with the exception of Virginia, that made such a good show either in the manufacturing of tobacco or the tax paid as this one house. An army of over 2,500 men, boys, women, and girls is kept constantly employed. About $14,000 is dispensed weekly for the labor, and it would amount to a calamity to these people if such an institution were to cease its operations from any cause even temporarily.

PATENT OFFICE PRACTICE.

Commissioner Paine announces that hereafter letters patent and certificates of registration will be perfected and ready for delivery upon the day of their date. The last issue, under the rule heretofore existing, will bear date of December 17, 1878. Then there will be a hiatus until January 7, 1879, on which day, and subsequently, patents and certificates will be deliverable as soon as signed.

The *Official Gazette* of even date with the weekly issue will continue the usual announcements respecting the perfected patents and certificates of that date, but no information, either by *Gazette* or otherwise, will be given as to any pending case about to issue, except to the party in interest, until such case has been finally signed and sealed.

A NOVEL thermoscope and hydroscope, the invention of Col. Aristide Gerard, has recently been patented both in this country and in Europe, and is controlled by the Automatic Safety Company, of No. 40 Charles street, New Orleans, La. This invention is designed for the speedy detection of abnormal heat or water in steamers and other vessels, and is said to be very effective.

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CHICHESTER WATER WORKS.

The prominent position now taken among engineering questions by those of water supply, especially to small places, will make the following illustrated description of Chichester water works of considerable interest to our readers. The works contain several features of engineering interest, and are such as are suitable for a large number of towns.

The source of supply is a well sunk in the chalk, adjacent to a powerful spring one and a quarter miles west of the city. The exact position of the well was determined by the certainty of an adequate supply being obtainable near the spring, while its location so far from Chichester was fixed with a view to avoid the contaminated water inclosed in the geological basin over which the city stands.

The works consist of a pumping station at the source of supply, a main pipe, 2½ miles long, passing through the city to a service reservoir and tower, and four miles of distribution pipes. They were designed to supply eventually a population of 10,000 persons with 20 gallons per head per day. At the pumping station the sinking of the well was commenced with wooden cylinders 6 feet diameter inside the curbs, for a depth of 17 feet, after which it was continued with wrought iron cylinders 5 feet 8 inches inside diameter. The cylinders were 9 feet long, connected by angle irons 3 inches by 3 inches. The plates were $\frac{7}{16}$ inch thick, and the rivets were countersunk on the outer side. The wooden cylinders were lined with brickwork in cement, and the junction between the brickwork and iron was securely calked with oak wedges. A foundation for the superstructure of the engine house and the engines was secured by a dome of cement concrete.

The engines and pumps are in duplicate, each designed to raise on trial 10,000 gallons per hour against a head of 200 feet, with a consumption of 3½ lbs. of Welsh coal per horse power estimated by the water lifted, and in actual work they each lift 11,500 gallons per hour against a head of 160 feet, with a consumption of 4 lbs. per horse power.

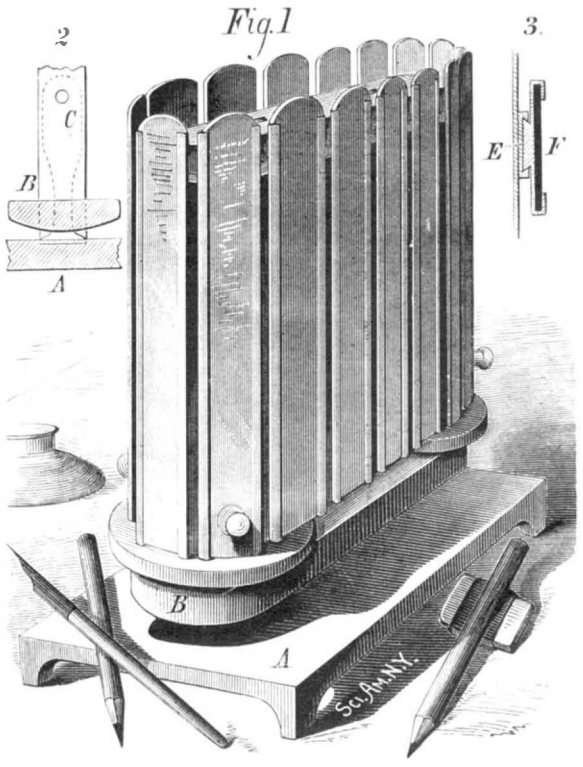
The engine is horizontal and of the usual compound type, with the high pressure cylinder toward the crank and in front of the low pressure cylinder. The diameter of the high pressure cylinder is 9½ inches, and that of the low pressure is 18 inches, and the stroke is 2 feet.

On the end of the crank shaft is placed a disk, from which the pump is driven direct from the main shaft. The pump is of the plunger and bucket type. The diameter of the plunger is 8 inches, that of the bucket 11 inches, and the stroke 1 foot 6 inches. Steam is supplied from two Cornish boilers of 4 feet diameter and 14 feet in length, with one flue in each of 2 feet 2½ inches diameter. The speed of the engines was designed to be 30 strokes per minute, and in actual work they run from 28 to 35 strokes per minute.

It is proposed to check the engines more by employing a slide valve on the steam pipe, which is to be kept open by the pressure of the column of water, and to be instantly closed by a spring when the pressure is relaxed.

The reservoir was designed to hold 100,000 gallons only, though provision was made for doubling its capacity eventually if necessary. It is 10 feet deep, and is built on a subsoil of wet sand and gravel, of Portland cement and gravel concrete (1 to 6), rendered with cement and sand (1 to 3), and floated on the inside surfaces with cement and sand (1 to 1). The main is taken through the wall so as to project about 6 feet into the reservoir. This projection was bedded in and surrounded with cement, and then built round with a block of concrete, having all its outer surfaces rendered in cement. All angles and corners were run with a fillet of cement, and thus a completely watertight job was effected without puddle. The whole was arched over in brickwork, and covered with an earth embankment.

Fig. 1



ALBER'S REVOLVING INDEX.

The highest ground available for the reservoir is only 60 feet above Chichester Cross, which may be taken as the average available head at the reservoir for almost all the district to be supplied. This head is increased to about 100 feet at the Cross when the pumps are at work, but inasmuch as the supply to the higher parts of the district would thus have depended on the pumps, and would have been intermittent and uncertain, a high level service was arranged by which a cistern is filled daily for each consumer requiring it, and a tank at the high level is always kept full and available for the extinction of fire.

To effect this, instead of a stand pipe, the tower, shown in the engraving, was built with a tank at the top 40 feet higher than the reservoir, into which, when a valve on the main at its base is closed, the water rises up an 8 inch pipe and through a self-closing 8 inch valve seated in the bottom of the tank. The ordinary outlet from the tank being only through the overflow at the top, and thence into the reservoir, the tank is always kept full. The high service cisterns of the consumers are filled from the rising main, which has thus an additional 40 feet of head thrown upon it during the time that the engines are pumping into or over the tank for the purpose of filling the cisterns. The 8 inch self-closing valve in the bottom of the tank contains a 4 inch valve, which works with it on the same spindle, except when raised by a chain pulled from the chamber on the ground floor of the tower.

In case of a fire occurring when the pumps are not at work, and the pressure in the city is consequently low, the valve on the main at the bottom of the tower being closed, and the chain pulled, an extra head of 40 feet is thrown upon the pipes. The quantity of water in the tank is sufficient to supply one hose of the Metropolitan Fire Brigade pattern for about thirty minutes, and would allow time for getting out the fire engine and for starting the engines at the pumping station.

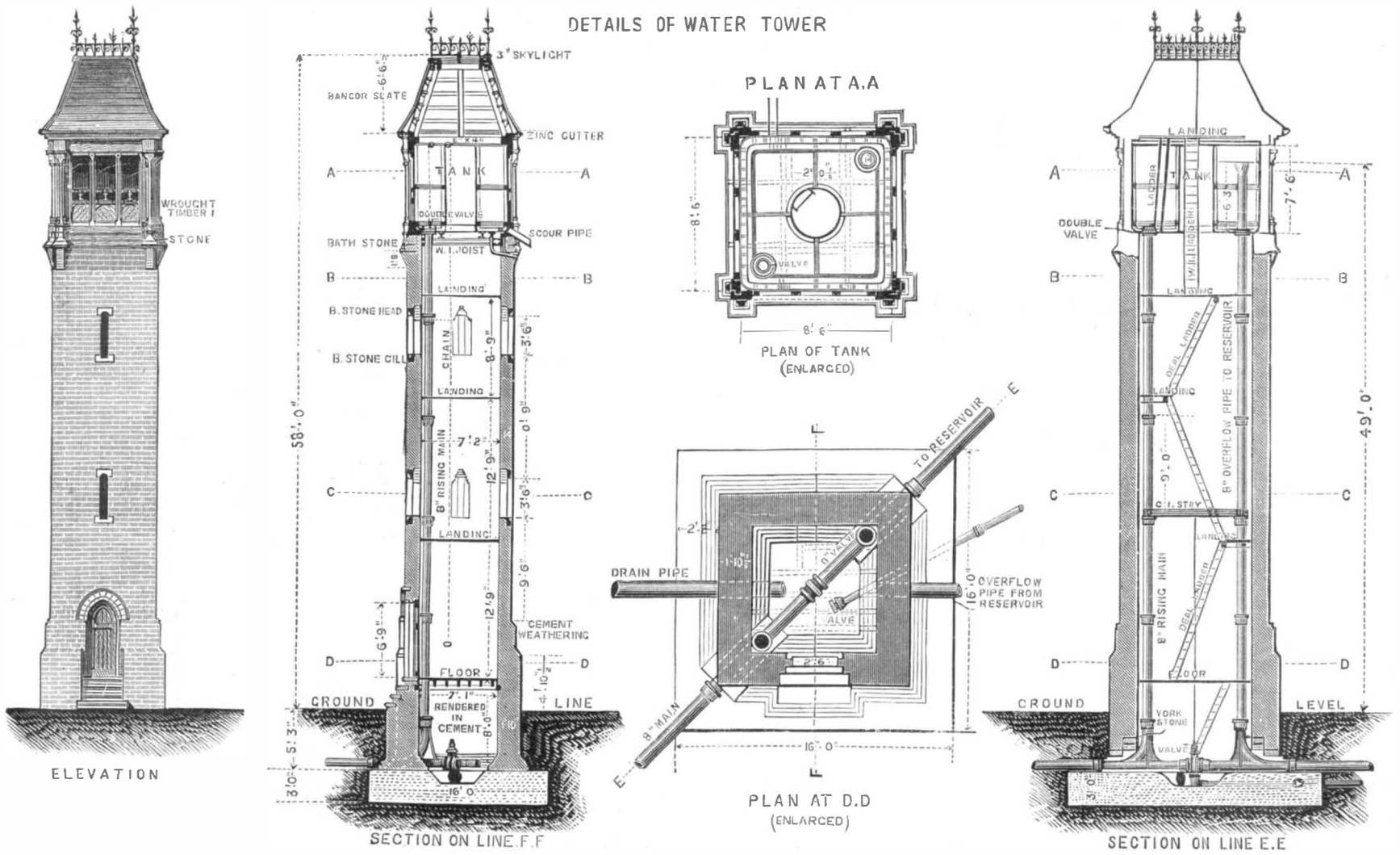
It is conceivable that such "fire reservoirs" might be applied on a large scale where high pressures would be otherwise difficult to obtain, and that they might be promptly brought into operation when needed by a telegraphic message to the man in charge.

The cost of the whole works, including a large sum spent in a parliamentary contest, amounts now to £14,500, and estimating that another £1,500 will be wanted to complete the distribution pipes, etc., for the supply of 10,000 persons, the total cost will be £16,000, equal to £1 12s. per head. The engineer of the company is Mr. Shelford, of Westminster, under whose direction the works were completed.

A NEW REVOLVING INDEX.

The accompanying engraving represents a revolving index recently patented by Mr. Lübbe U. Albers, of Carthage, Ill. It is intended for the use of book-keepers and others requiring a ready means of referring to different names or items contained by the index.

To the center of the base, A, is attached a standard, C, which passes through the lower bar, B, of the frame that supports the vertical rollers around which the endless belt, E, passes. To this belt are attached a number of strips of sheet metal, which are bent outward to form slides for receiving the strips, F, of sheet metal which contain the strips on which are written the names, number of page, etc. These strips have at their upper ends the alphabet, and several of the strips, F, have small knobs for convenience in turning the endless belt. The belt and its supports may be inclined at any desired angle, and the strips may be removed when filled and filed for future reference. The advantages of this device will be apparent to those who require an index. It certainly will effect a considerable saving in time. For further particulars address the inventor as above.



CHICHESTER WATER TOWER.

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SACK HOLDERS AND LIFTERS AT THE EXHIBITION.

"So much sack."—SHAKESPEARE.

The uses of convenient implements are spreading into all the industrial occupations, as we in the United States know better than any other people, for we have more inventions of that character than are to be found elsewhere.

Fig. 1.—ROSE'S SACK LIFTER.

Churns of curious design, washing machines, egg beaters, apple parers, and scores of other conveniences for domestic uses and ordinary occupations are advertised and labeled as "American."

The word "sack" is said to be the only one that is the same in all languages. Here is one thing in common between the Hebrew, Irish, Greek, Cornish, French, Latin, English, Hungarian, Icelandic, and Gothic; here they unite. How this came about it is hard to say, but the legend goes that when tongues were confused at the Tower of Babel, the workmen finding that something was going wrong, each called for his sack to carry home his tools in, and that was the only word they all remembered.

The sack lifter of Messrs. Rose Frères, Fig. 1, is similar to Marshall's sack elevator, Fig. 2, but has a standing frame which is portable, but not designed to be used as a truck. The sliding bag holder is lifted by cord from a winch on the frame, and held by a click in a ratchet wheel on the crank shaft.

Marshall's sack elevator, Fig. 2, is a truck, with stay rod to hold it upright, and a winch by which the sliding frame holding the bag is elevated so that a person can take it upon his shoulder and carry it off without the assistance of a second person in lifting. It is specially intended for a person in attendance upon a thrashing machine; one man to tie the bags as they are filled, lift them, shoulder, and carry them off to the granary.

Romaine's sack filler and weigher, Fig. 3, requires but little description to elucidate it. A spout with sliding door admits the grain, flour, or whatnot from the floor above. The bag is clipped by a ring to the funnel, which is suspended from a crotch on the end of the weigh beam. The latter is upheld by a tripod. Price from 150 to 325 francs; weighing from 200 to 100 kilos.

The small army mill, Fig. 4, stands upon three legs and grinds into a sack which is suspended beneath. It is worked by two men, grinds 20 kilogrammes per hour, costs 200 francs; four of them, packed in two boxes, are the load for a mule on the march.

The sack lifter and emptier, by Rose Frères, Fig. 5, enables one person to lift and to transfer the contents of one sack into another. It acts by means of a winch and rope, but the sliding frame is guided in such a manner that after attaining a certain elevation it tips over and brings the mouth of the sack to the open end of the bag ready to receive it.

The French sack holder of Bodin is so much like the Gilbert, Fig. 8, with the addition of wheels, that it needs but to say, in addition to giving the illustration, Fig. 6, page 20, that its weight is 28 kilos, and its price 50 francs.

John the Baptist Normand fits the handles of the truck with notches, so that the spreading frame for the sack mouth may be adjusted in height for the length of the sack. The frame has four hooks on to which the hem of the bag is caught (Fig. 7). Price 35 francs.

The Gilbert (English) sack holder (Fig. 8) is a slanting frame, with a strut to support it, and a clip ring at top to spread the mouth of the sack. To state its purpose would be merely to make a list of things that can be put into a sack, which is needless. It dispenses with a man to hold the sack, and furnishes a rest for the measure in emptying. Its price is £1 3s.; with wheels, £1 12s.

EDWARD H. KNIGHT.

Paris, October 5, 1878.

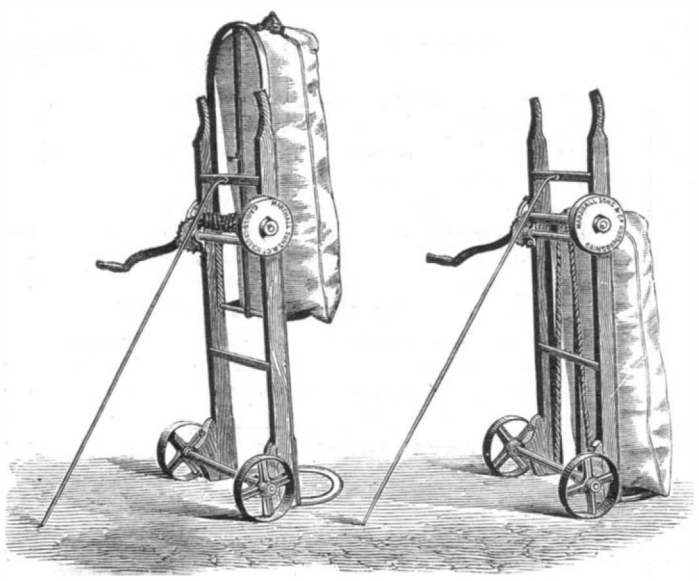

Fig. 2.—MARSHALL'S (ENGLISH) SACK ELEVATOR.

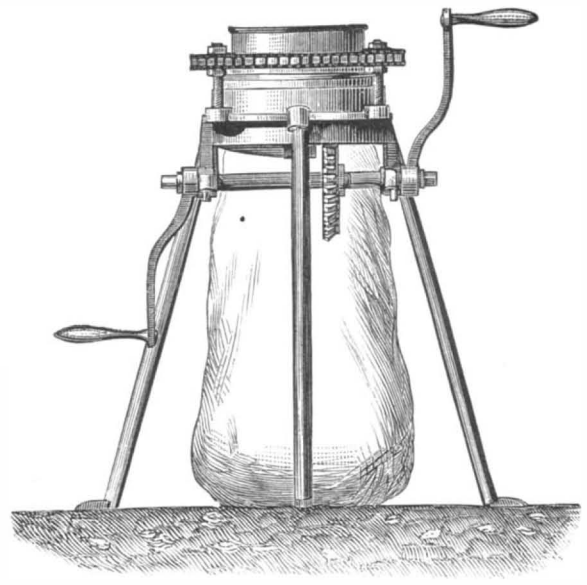

Fig. 4.—ARMY MILL.

Amateur Inventors.

The Philadelphia *Ledger* takes to task those papers which have sneered at Miss Hosmer's electric light invention on the ground that "amateurs rarely discover anything worth patenting." Of course, an amateur who knows nothing about mechanics, adds the writer, is not likely to make valuable contributions to mechanical progress; but there are many amateurs self-educated in science and mechanics, and from this class some of the most original inventions have come. Miss Hosmer's profession—art—has furnished the world with at least two great inventors, who, though amateurs in one sense, led the way for "scientifically educated and practically experienced mechanicians." Robert Fulton and Professor Morse were both American painters, and both became distinguished American inventors, although they were amateurs in their particular fields of investigation. The history of invention points to the fact that entirely novel ways of doing things are likely to first suggest themselves to those who, being amateurs, have not become set in their ways of doing every-day work. Watt, although a mathematical instrument maker, did not stick to his trade, but invented many essential parts of the steam engine; Corliss was a country storekeeper; Elias Howe was more of a farmer than a mechanic when he made his first sewing machine, and Edison has "picked up" all that he knows about electricity, mechanics, and magnetism. Education and practical experience are very desirable things, but because an inventor's calling seems to show that he has neither one nor the other is no reason for throwing discredit on his invention in advance of experiment with it, and particularly before it has been described.

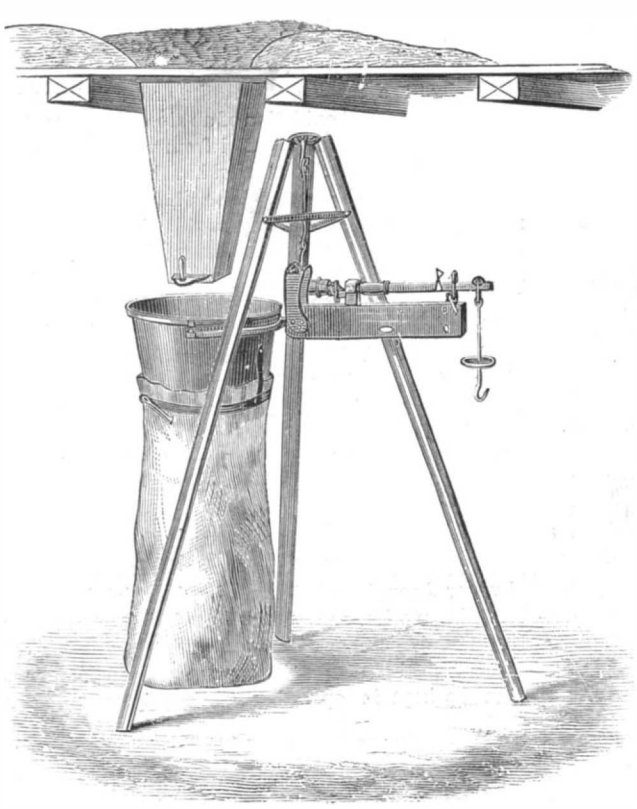

Fig. 3.—ROMAINE'S SACK FILLER AND WEIGHER.

Paper for Preventing Fraud.

Mr. A. Nesbit, of Gracechurch street, London, is the manufacturer of a paper for checks, bank notes, deeds, law documents, or other instruments of a similar character, so as to prevent alterations by the use of chemicals, including acids and cyanide of potassium. For this purpose he mixes with the paper pulp or passes the manufactured paper through an alkaline solution of peroxide of iron (or any salt of peroxide of iron) and ferrocyanide of potassium, or other base, in which the iron is kept from precipitating by the addition to the solution of tartaric acid, citric acid, sugar tartrates or citrates, or other organic substances having the power of preventing the precipitation of oxide of iron by an alkali, or sulphocyanide may be substituted for ferrocyanide, or ferricyanide may be substituted for ferrocyanide, and the salt of protoxide of iron for one of peroxide of iron. Upon the application of a chemical to paper manufactured or treated according to the invention a color or stain will be produced, whether the chemical be applied over ink or not.

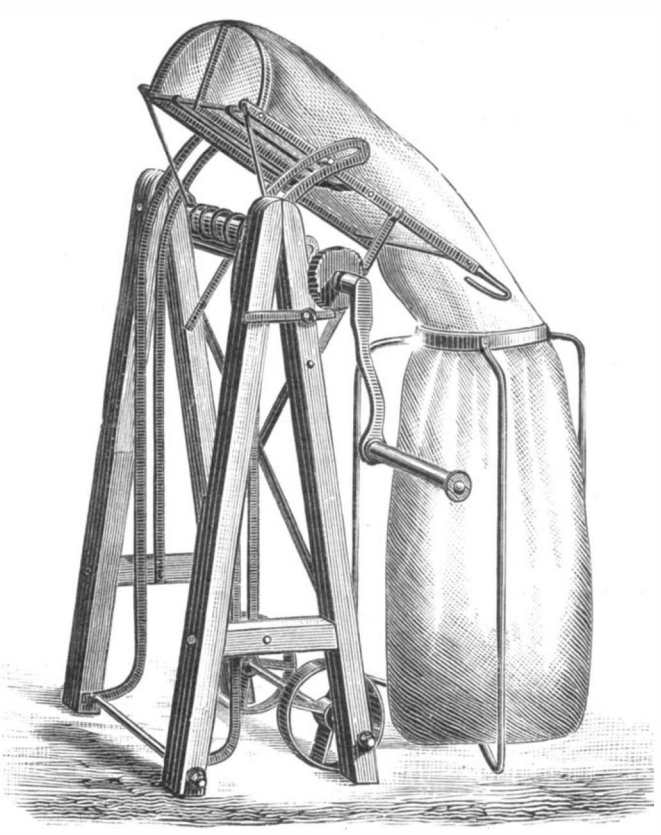

Fig. 5.—ROSE'S SACK LIFTER AND EMPTIER.

Erin go Bragh.

A fictitious cable dispatch of inordinate length, purporting to emanate from a staff correspondent who has, says the New York *Tribune*, been sent across the seas to find Mr. Edison, is an amusing *jeu d'esprit* in *Saunders Irish News*.

When the correspondent landed in New York, President Hayes went tearing down Broadway to the Battery in an open carriage drawn by six cream colored horses, and preceded by a number of outriders in scarlet and gold, and a squadron of siege artillery in full gallop. As they approached, the President descended from his carriage, saluted the correspondent on both cheeks, and immediately raised a cheer, which was at once taken up by his party, and repeated from the Battery to the Central Park. The President carried his guest off to the White House, where they had bird's-nest soup, bluefish, bread fruit, pilaff, and oysters in every style. After lunch the President drove the correspondent out (without the artillery) to see the sights in the immediate neighborhood—the Falls of Niagara, the prairies, the Yosemite Valley, and giant trees in Mariposa County. When he learned that the Irishman had crossed the seas to talk with Mr. Edison, the President urged him to do nothing of the

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sort. He remarked that the inventor was hardly ever at home, being generally in the Patent Office registering some new discovery, and besides he was so highly charged with electricity that it was dangerous to approach him. The President remarked that the inventor was frequently seen with a regular nimbus around his head, a sort of domesticated aurora borealis, and one man who shook hands with him in a casual way, went home, took to his bed, and was prostrated by the violence of the electrical shock.

Anhydrous Sulphuric Acid.

The well known oil of vitriol, as our readers know, is a compound of sulphur, oxygen, and hydrogen, in the proportion of 16, 32, 1; and has received the formula H_2SO_4, or $H_2O.SO_3$. Although we are not able to remove from this any water, as the last formula seems to indicate, yet a compound is known which will combine with water to produce the oil of vitriol, or common sulphuric acid, and hence it was called anhydrous sulphuric acid, or sulphuric anhydride, and supposed to have the formula SO_3. It is a white, silky solid, forming long needles like asbestos, and can be obtained in two or three different ways, usually by distilling so-called Nordhausen or fuming sulphuric acid at a moderate heat. It is also made by oxidizing sulphurous anhydride, SO_2.

Weber's investigations have proven that these crystals are not anhydrous, but mixed with a hydrate. By repeated distillations, fractional distillations, and recrystallization, he obtained the pure anhydride, which is, at common temperatures, a mobile, colorless liquid, which solidifies on cooling strongly to long transparent crystals, resembling those of saltpeter, but totally unlike those white, opaque, silky crystals formerly mistaken for sulphuric anhydride. The pure anhydride melts at 14·8° C. (58·6° Fah.) and boils at 46·2° C. (115° F.). The slightest trace of moisture converts it into the well known silky crystals. Weber succeeded in separating two hydrates, one having the composition $H_2SO_4.3SO_3 = H_2S_4O_{13}$, and the other, $H_2SO_4.SO_3 = H_2S_2O_7$.

He also investigated the blue compound produced when sulphur and anhydrous sulphuric acid are brought into contact, and first described by Vogel in 1812, and finds that it has the composition S_2O_3. When dry flowers of sulphur are thrown into freshly prepared liquid sulphuric anhydride (SO_3) the sulphur melts to blue drops, which sink below and soon solidify. When a sufficient amount has collected the liquid anhydride is poured off, and the residue then removed by gently warming. It forms a crystalline crust which looks like malachite and decomposes, slowly at common temperatures, faster if heated, into sulphurous acid and sulphur ($2S_2O_3 = S + 3SO_2$). It dissolves with a blue color in so-called fuming, or Nordhausen, sulphuric acid. Water decomposes it, setting free sulphur and sulphuric and sulphurous acid and thiosulphuric acid. This blue color was made by Bucholz in 1804, by heating sulphur in fuming sulphuric acid.

This adds another to the already long list of oxygen compounds of sulphur, to which Berthelot not long since (*Comp. Rendus*, 86, 20) added persulphuric acid S_2O_7, so that to all the oxides and acids of chromium there are corresponding oxides of sulphur, and it only remains to find more oxides and acids of chromium to correspond to those of sulphur.

Crystallized Javelle Water and Chlorozone.

This absurdly contradictory name, eau de Javelle cristallisée, is given to a commercial article made in France, which is intended to take the place of chloride of lime or bleaching powder for washing and bleaching cotton, linen, and paper stuff. The claims made for it are its perfect solubility in water, uniform and certain action upon the fiber without injury to it, saving of cost by lessening the number of operations in the bleaching process, and, finally, more convenient and cheaper to transport. We have no details as to what it really willdo, but it seems probable that if rightly made and used, it may, in many cases, surpass chloride of lime, provided its present high price be somewhat reduced. The well known Javelle water is merely a solution of hypochlorite of potash, and much used as a bleaching agent, as is also the corresponding salt of soda, eau de Labarraque. Neither of these are crystallizable, so that there can be no such thing in reality as crystallized Javelle water. The product under discussion has the following composition: 80 per cent crystallized carbonate of soda, 8·5 per cent chloride of sodium (salt), 11·5 per cent hypochlorite of soda. The best name for it is sal soda impregnated with hypochlorite of soda. The manufacturers claim for it the power of cleaning and bleaching in one operation, without previously having put the stuff through an alkaline lye for the purpose of cleaning it perfectly. The carbonate of soda, they claim, is the cleansing principle, and the hypochlorite destroys the coloring matter. The two act simultaneously, which of course saves time. We are not aware whether in practice this is true, but it is possible.

Particular emphasis is also put upon the assertion that the stuff to be bleached is not injured by this salt, as it is frequently enough when chloride of lime is used: first, because the action is slow and regular; next, the total absence of lime renders the formation of any injurious lime precipitation in the goods impossible; finally, the solution is not totally worthless after the bleaching is done, but can always, owing to the relatively high percentage of soda in it, be employed for washing either immediately or after it has been rendered caustic by heating it with quicklime. The salt, as it is sent to market, is quite well crystallized, resembling sal soda. It possesses the characteristic odor of chloride of lime, dissolves perfectly in water to a clear solution, which should not be underrated for practical purposes, as no decantation or letting it settle is necessary, and a solution of any desired strength can be made at once. It must be kept in a dry place, as it absorbs moisture readily and would soon become wet through. The manufacturers claim that it keeps well, which we doubt, for the analysis of a specimen kept in a closed glass gave only 1·33 per cent of active chlorine.

Fig. 6.—BODIN'S SACK-HOLDING TRUCK.

Chlorozone is another new commercial article. It is made by saturating a cold solution of the caustic or carbonated alkali with a current of hypochlorous acid mixed with air. The hypochlorite indicates nearly 40° Baumé, and 100° to 120° chlorimetry. By the addition of calcined soda it forms solid chlorozone, as a compact mass that can be broken up, but melts at 68° Fah. The price is not much above that of chloride of lime.—*Schweizer Gewerbeblatt.*

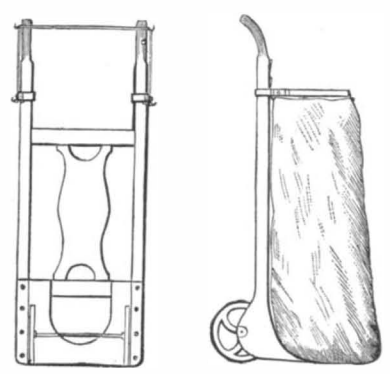

Fig. 7.—NORMAND'S SACK-HOLDING TRUCK.

Chemistry in Schools and Colleges.

It is scarce a century since chemistry began to exist as a science, yet few sciences have contributed so much to the happiness and pleasure of mankind. The problems before her are infinite, but one after another are slowly being solved. So many are the fields for her labor and so varied her work, that we cannot wonder that many people have very strange, contradictory, and absurd notions of what chemistry is. One thinks it consists chiefly in concocting unpalatable potions, another in making awful stenches; some confound the chemist with the magician, others think he must be an apothecary or a physician. But chemistry moves on in spite of opposition or ridicule, and even gains in public popularity. Although the grand fundamental laws of the science, the great underlying principles which are to explain all its phenomena—as Newton's law does those in astronomy—have not yet been discovered or evolved, and the accepted theories of to-day may be overturned to-morrow, yet chemistry is no longer what it once was—an accumulation of facts, of disconnected phenomena, with which the memory may be overloaded without profit. Its facts have been reduced to system, some of its laws are understood, and the harmony of its several parts are known. For this reason, as well as for its practical and conomical uses, it has taken its place in the list of subjects which constitute a liberal education. Hence we find few schools for either sex where two or three hours a week are not devoted to this subject, and even in private and preparatory schools it is taught by experiments and lectures, not as dry text-book catechism, and the mind is at least incited to know something of this world about us.

Fig. 8.—GILBERT'S SACK HOLDER.

At a period when the value of natural and physical sciences as a source of mental discipline is beginning to be acknowledged, and science itself to be respected and honored here as elsewhere, it is somewhat remarkable to see one of our oldest colleges abolish the study of chemistry in her regular course. Yet this is what Columbia College has really done. True, the name of chemistry still appears in her list of studies, but it is studied no longer. It is but an outward pretense, a sham, an empty name, a skeleton without flesh, a shell without contents.

One of her youngest classes assemble once a week to listen to lectures upon chemistry by one of her best and ablest professors; but what can the greatest of chemists teach in 25 hours to a class who have had no preparation for his teaching? Chemistry is there made to precede physics, the larger fundamental science of which it is itself one of the larger subdivisions. Hence the lecturer must either prepare the soil himself or have the seed fall upon hard ground. To lecture upon the spectroscope to men who know nothing about light, or upon gases to men who know nothing of the laws of mechanics and pneumatics, is to waste half the labor. To assume that the students have learned, before they entered college, subjects too abstruse to be taught them while in college, is the height of absurdity, and yet strangely enough the Columbia Grammar School teaches more chemistry, and teaches it more thoroughly, than does the college. The senior class may, if they choose, attend a few lectures upon advanced chemistry along with students of the School of Mines who have devoted one or two years to this branch, and not having had any preparation at all sufficient, are again unprepared to profit by it. Let us ask why this change has been made and the amount of chemistry reduced to one fourth of what was already too little. Columbia is about to erect new buildings and wants to save the expense of a chemical lecture room. She also wants to economize on the salaries of her professors in science to enable her to employ more instructors in law and in history. To this the welfare of her students and her own good reputation are subservient. Let her seek concealment as she may, truth must prevail.

Salicylic Acid with Boracic Acid.

Both of the above acids are extensively employed as antiseptics in foods, as neither of them alone imparts any unpleasant flavor, but if both are used together a decidedly bitter taste results. This fact was first noticed by Dr. Hager, who examined a milk with a bitter taste, but failed to find any particular bitter substance in it. On further examination it was found that borax had been added to protect it against the heat of summer, and afterward a little salicylic acid was added for its preservation during transportation.

Another case was where a mixture of 2 parts salicylic acid, 2 of borax, 30 of alcohol, and 200 of water had an exceptionally bitter taste. In both cases the bitter taste was produced by this combination of salicylic acid with borax. That it was due to the acid and not to the soda, was proved by the bitterness being imparted at once to a solution of salicylic acid on putting in some boracic acid.

Consequently the use of both antiseptics at once must be avoided, and only one employed at a time. To test the truth of Dr. Hager's assertion, our readers need only to dissolve a grain or two of boracic acid in alcohol on a watch-glass and then add a crystal of salicylic acid; in a few seconds the taste will be almost as bitter as that of sulphate of quinine. Perhaps salicylic acid can be employed as a quick and certain test for boracic acid in food, especially canned meats.

Methyl Aldehyd.

Aldehyd is a name given to the first substance produced by the slight oxidation of an alcohol. It contains less hydrogen than the alcohol from which it is made, hence its name. Methyl alcohol has the formula CH_4O, but the aldehyd is CH_2O. The difficulty in its preparation consists in its passing rapidly into another and more permanent form of oxidation, known as formic acid CH_2O_2. When a piece of hot platinum wire or foil is suspended above a vessel of alcohol it continues to glow, owing to the slow oxidation of the alcohol. Professor A. W. Hofmann has condensed the liquid given off in this form of glow-lamp, or lamp without flame, and finds it never contains more than 1 per cent of aldehyd.

The amount of aldehyd was determined quantitatively by converting it into the sulphur compound. The experiment was changed in many ways to obtain a more concentrated solution of the aldehyd. The most successful results were obtained by passing a suitable mixture of air and methylic alcohol vapor through a platinum tube, in which is a bundle of thin platinum wire, and gently heated. On condensing the escaping vapors it contains on the average not less than 5 per cent of alcohol. If suitably mounted such an apparatus can be kept in operation without interruption for months.

If the undecomposed alcohol be removed by distillation (when some aldehyd escapes also) and the residue frozen several times to remove the water, the aldehyd can be concentrated to 10 per cent and upward.

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Correspondence.

Baking Powders and Glucose Sirups.

BY ROBERT PETER, M.D.

(Professor of Chemistry, etc., in Kentucky Agricultur l and Mechanical College; Chemist to the State Geological Survey, etc., etc.)

Although several communications have appeared in the SCIENTIFIC AMERICAN on these subjects, the writer believes they are not yet exhausted of their interest. The possibilities connected with their bearing on health or disease and mortality deserve further discussion, for which I have no doubt you will freely give a few more columns in your highly useful periodical.

The obvious fact is, as proved by the analyses of baking powders by others as well as by myself, that desiccated alum is substituted for cream of tartar in many of our popular "baking powders."

The United States Patent Office has sanctioned this use or abuse of alum by their letters patent, and alum is very much cheaper than cream of tartar; answers equally well to set free the carbonic acid which makes the bread light, and may also make a whiter loaf than that dearer article. The manufacturer can make more profit at a lower selling price, with alum powder; more especially if he mixes them with a large proportion of starch.

The chemical facts are as follows: By heating the ammonia alum to a certain temperature it will be caused to part with its water of crystallization, and will lose part or all of its combined ammonia, according to the temperature and time of exposure to it, leaving simply aluminum sulphate, mixed with more or less free sulphuric acid and undecomposed aluminum sulphate. This mixture when brought together with bicarbonate of soda, in the paste or dough, in the presence of the water will decompose the soda salt, especially when moderately heated, and the carbonic acid of that salt set free will inflate the pastry and make it light and spongy. At the same time the alumina of the alum is separated in the form of aluminum hydrate, and harmless sodium sulphate, or Glauber's salt, is produced.

The nature and results of the chemical decomposition are correctly stated by Professor Doremus, as well as by the patentees of these baking powders. There is no alum in the bread or other article prepared with these powders, but only the products of its decomposition, viz.: Glauber's salt, in too small quantity to be active, and precipitated aluminum hydrate.

But at this point a new question arises, and one of weighty import: Is it not probable that the continued ingestion of aluminum hydrate with our daily food, may, in the long run, induce disease and shorten life?

It is true that when alumina is in combination with silica, as it is in clays, it is not readily soluble or decomposable in weak acids; but alumina combined only with water, or even when the water has been separated by ignition, is much more soluble. The heat which suffices to bake bread will not separate the water from aluminum hydrate, and it hence exists in the bread in a condition readily to form salts with even weak acids. What, then, is the probable action of this aluminum hydrate in the processes of the digestion and assimilation of the food in which it exists as an ingredient? In the stomach, under the action of the acid gastric juice, it is likely to be dissolved, and to form aluminum chloride; but, because of the great affinity of alumina for albuminous and other organic matters as well as for phosphoric acid, it probably enters into combination with these, to a certain extent at least. If these compounds are insoluble in the stomach solution, no other harm will result but a waste of a certain quantity of the essential phosphates and albuminates of our food, which waste may be measurably supplemented by the introduction of some bone superphosphate into the baking powders.

But it is more probable that at least a portion of the aluminous compound is retained in solution in the acid chyme and is absorbed into the blood vessels in the coats of the stomach, to act locally in thickening or otherwise altering their delicate coats; or meeting with the slightly alkaline venous blood, rich in albuminous compounds, to induce a tendency to coagulation, which, however slight, may in the course of time cause obstructions in important glandular organs, especially in the kidneys and liver, interfering with their healthy functions, and in the end causing fatal disorder.

The portion of the albuminous compound which is not absorbed from the stomach will doubtless be decomposed in the duodenum, where it will be rendered insoluble by contact with the alkaline bile; but in the cæcum it will again be subjected to an acid solvent, and a second danger of absorption consequently occurs. These are probabilities of deep import. Aluminum chloride, like tin chloride, forms insoluble compounds with albuminous, gelatinous, and other organic matters, and when introduced into the blood in quantity cause sudden death, and doubtless when taken up in repeated minute quantities, will cause alterations of tissues and coagulations of the circulating fluids resulting in obstructions and disease.

The use of chloride of tin by reckless manufacturers of glucose sirups, etc., proved by numerous analyses by others as well as by myself, is especially to be reprehended, as these products, sold under various names, as "golden sirup," "maple sirup," "sugar-house molasses," etc., or the glucose in the solid form mixed in the soft granular sugars, are in very general use, greatly to the detriment of the general health. The people everywhere should be put on their guard against this insidious slow poisoning and advised against the use of any sirup, etc., which leaves a metallic taste in the mouth. Three pounds of good pure Louisiana brown sugar, boiled in a clean iron vessel with a pint of water, will make a perfectly wholesome sirup, far preferable to any of the tainted sirups of the present market.

Aluminum and tin salts are both used as mordants by the dyer, because of the strong attraction of the oxides of these metals for organic compounds. Aluminum salts for the same reason are used in preparing white leather, and the observations of Orfila show that when given to animals they cause a thickening of the coats of the stomach and bowels, and an appearance as though they had been tanned.

It is true that Orfila contended for the harmless nature of alum in small doses, and Wibmer and others experimented on themselves by taking it in small doses for some weeks together without any sensible evil results. Very probably the slight impairment of tissue was not sufficient to produce manifest disease. But had they continued their experiments for years at all their daily meals, no doubt the functions of the stomach would have become impaired by the thickening of its coats and the alteration of its glandular tissue under the action of the dissolved aluminum salts, and dyspepsia or chronic inflammation would be the result in time.

That alumina is not friendly to organic life is shown by its almost general absence from the composition of vegetables and animals. In only a very few plants of the lowest order is it found as a regular constituent. The propriety of introducing it into our daily food is not properly to be ascertained by costly and broadly hazardous experiments upon the people at large, or with the object of cheapening the production and increasing the profit on baking powders. Nor is there any necessity for such heroic tampering with the public health. Why lay aside the time-honored yeast or ferment, which, when skillfully and carefully prepared and used, is without injurious influence? Or, if we must have "quick-rising," why not use the pure cream of tartar and good bicarbonate of soda until something equally harmless is discovered?

The writer is informed that there occur many more cases of Bright's disease and other forms of disease of the kidneys than formerly. Are we to attribute this to chloride of tin in glucose sirups and sugars, or to alum in baking powders, or are not both very liable to suspicion?

Even the cream tartar baking powders may come in for some share of guilty responsibility because of the greater amount of alkaline salts determined to the kidneys by their habitual use, and that most *chemical* of all baking powders, Horsford's, which, with the commendation of Liebig, might seem to be pathologically innocent, as it is chemically excellent, may yet, by a possibility, give to the renal organs too much earthy phosphates to excrete in solution. "Give us," therefore, our "old-fashioned daily bread" until something better is discovered than is found in all the baking powders.

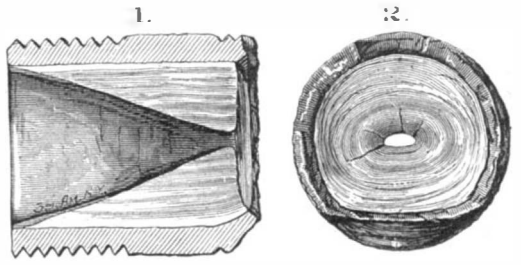
Choked Feed Pipes.

To the Editor of the Scientific American:

I send to you by mail a ¾ inch nipple that was taken from the feed pipe of a ten horse power portable thrashing engine.

The engine was brought to the shop to have a new check valve put on, as the one that was on was badly worn. To remove the old one, we cut off this nipple close to the boiler, and were surprised to find that the pipe where it entered the boiler had been reduced in area to about 0·01 of a square inch, by deposits of lime.

The persons in charge of the engine said that they had had no trouble in keeping the boiler well supplied with water, and had used it several days this season, before bringing it to the shop, using the steam at 100 lbs. pressure.



The pump plunger was attached to the cross head of the engine. Had the pump been driven by a belt they would have experienced much trouble in driving it.

Several months ago, a man owning a saw mill brought his force pump to be repaired. He said that he could not drive it with an eight inch belt, while it used to be driven easily with a four inch belt. After examining the pump, I told him that it was all right, and could do nothing for it, that the pipes from the pump to the boiler might be filled with lime (as the water passed through a heater before it came to the pump), thereby obstructing the passage of the water. He did not think much of the idea, but went home with his pump. The next day he returned with the pipes; some of them had become so filled with lime that the passage remaining was not more than one tenth of a square inch in area.

Yours respectfully,

IRA CARNES.

A Model New England Farm.

Mr. Burnett, the owner of the three hundred acres in Southboro, Mass., known as Deerfoot farm, makes a specialty of breeding, raising, and fattening hogs, and converting them into various articles of food, and of the products of the dairy. The conversion of the carcasses into hams and bacon, and the manufacture of sausages and lard are carried on in the most systematic manner and on an extensive scale, extra pains being taken to produce for the private consumption of customers in Boston, New York, and Philadelphia, the choicest and most palatable articles. Mr. Burnett raises about 350 hogs annually, and purchases from the farmers of Vermont 1,500 fat Berkshires, which make the best pork. After being dressed the hogs are kept in a refrigerator for forty-eight hours, when they are cut up, the hams and bacon cured in the most approved manner, the lard dried out and canned free from adulteration, and the pork packed in kegs of 15 and 25 lbs. weight; the sausage meat chopped by machinery and seasoned with the best quality of sage and pepper that can be obtained, and then made into sausages. Mr. Burnett's bacon has taken the place of imported English bacon in the Boston market, and become so popular in Philadelphia that one dealer has offered to take the entire product of Deerfoot farm, which amounts to 300 sides a day, while 3,000 hams are cured annually. The product of sausages averages about 1,000 lbs. a day. Another specialty of Mr. Burnett is the canning of pigs' feet, which are sold largely in the season to yachting parties. The piggery at Deerfoot farm is an extensive affair, located at some distance from the main buildings, and consists of a building 80 by 40 feet, with a wing 60 by 20 feet, containing pens, in which were seen about 250 swine of all ages, from the sucking pig to the hog ready for the scalding vat. The animals are fed twice a day, on a cooked mixture of two thirds corn meal and one third ground oats, which Mr. Burnett has demonstrated to be the most profitable food for fattening hogs. In the dairy the Devonshire process of producing clotted cream is used. New milk, scalded, is placed in long, large pans, which are placed under a refrigerator, where it is cooled rapidly, the temperature being reduced in three hours from 160° to 32°, and cream raised to the thickness of three fourths of an inch, which ordinarily required forty-eight hours. This cream will keep sweet several days, and is sold for 60 cents a quart to Boston families. Mr. Burnett also manufactures from 250 to 300 lbs. of butter a week from the milk of fifty cows, of which 25 are thoroughbred Jerseys. The butter sells readily at 75 cents a pound.—*Boston Transcript.*

Defeat of the Cochrane Ring.

It is our pleasing duty to record two defeats which the American Middlings Purifier Company has sustained. The first was in the injunction suit brought by the ring against Messrs. Vail & Shotwell, of New York city. As our readers remember, this case was argued before Judge Blatchford last summer, and the supposed proofs of infringement were collected by the plaintiffs with the greatest care. Judge Blatchford has refused the injunction on the very sufficient grounds that infringement was not proved by the plaintiffs. In the course of the hearing Judge Blatchford made a very important and sensible ruling in regard to the former decisions of the United States Supreme Court. He held that the decision given by that court last winter, when the millers made their motion to restrain the Cochrane patents, virtually destroyed the previous decision of the court in the case of the American Middlings Purifier Company *vs.* Deener, Cissel & Welch, so far as precedent was concerned, and that suits brought under the Cochrane patents must be tried as new cases in all respects.

The other victory is of equal importance. In May, 1877, in their first flush of success, while the first decision of the United States Supreme Court in their favor was still fresh in the minds of millers, the ring brought suit against the Haxall-Crenshaw Company, of Richmond, Va., proprietors of the famous "Haxall Mills." The claim of infringement was made and the damages claimed were placed at the modest sum of $100,000. The hearing was before the United States District Court for the Eastern District of Virginia, and the case was dismissed by the court during the past month. In a letter of recent date to the Hon. George Bain, of St. Louis, Mr. Philip Haxall, Vice-President of the Haxall-Crenshaw Company, says: "We have intended to take the first opportunity to advise you that we have gotten the suit of the Cochrane ring against us dismissed from court, and presume they will let us alone henceforth. It has been evident to us for some time that they did not wish it brought to trial, and we suppose they will put off their suits against Western millers in the same way until they have collected all the money they can from small millers."

There can be no doubt that Mr. Haxall is correct in his surmises as to the future policy of the ring. The result in his case undoubtedly foreshadows the outcome of all the suits which are now pending against millers, but the ring will certainly try to make the most of their time by terrifying millers whose means are limited into paying royalties rather than go to the expense of a legal trial. The Defense Association is to be congratulated on its victories, and we hope soon to chronicle the crushing defeat of the ring at St. Louis.

The final hearing of the cases at St. Louis is waiting solely upon the convenience of the judges, Judge Dillon's engagements having prevented him from going to St. Louis to try the cases. It is proposed to have both the St. Paul suits (American Middlings Purifier Company *vs.* J. A. Christian & Co., of Minneapolis) and the St. Louis suits argued at the latter place, in which event Judge Nelson, the District Judge for Minnesota, would sit with Judges Dillon and Treat.—*American Miller.*

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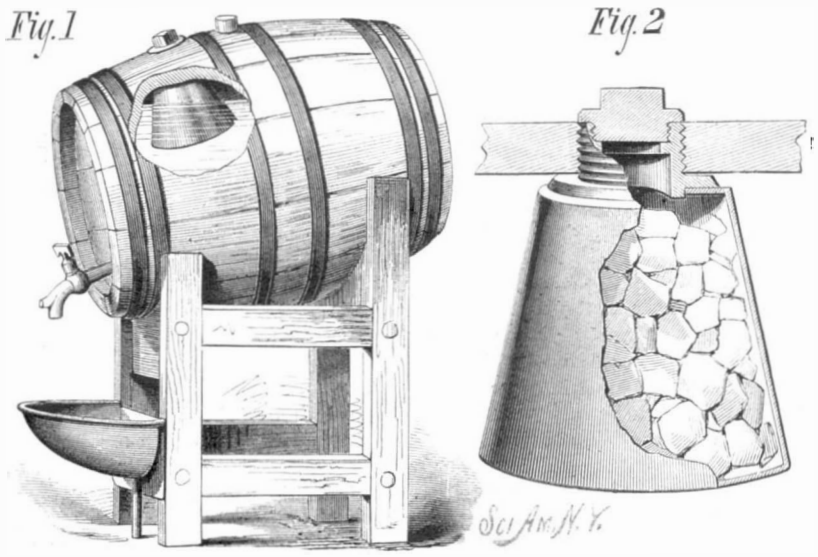
A NOVEL COOLER.

Brewers and dealers in beer, ale, and similar liquors well know the difficulty experienced in the transportation of barrels and kegs of such liquors in warm weather. To avoid the use of refrigerators, either in transporting or retailing the liquors, Mr. John Hoerr, of Denison, Texas, has devised and patented a cooling attachment for barrels, kegs, etc., by which, with a small amount of ice, the contents may be kept cool for a considerable length of time.

The invention consists of a vessel of galvanized or enameled iron secured to a cast metal neck, which is screwed permanently into one of the staves or heads of the barrel. This vessel is filled with ice and salt, and closed by a screw plug. As the ice vessel has no connection with the interior of the barrel, the ice and salt can be replenished as required without disturbing the contents of the barrel.

The inventor states that the device may be used to prevent freezing as well as to maintain a low temperature, and sends us the particulars of an experiment tried by him to test the efficiency of the cooler:

"On October 23d I had one keg of beer shipped to me by express from St. Louis, Mo. the keg being provided with one of my cooling attachments. On November 3d I tapped the keg at 8 o'clock A.M., at 80° in the shade, and found the beer to stand 63°. I poured one quart of boiling water into the cooler, turning the keg upside down; in fifteen minutes it had reached the temperature of 74°. I then emptied the cooler and charged it with 2 pounds of ice and a small handful of salt, bringing the temperature of the beer to 66° in thirty minutes, and five hours after it stood at 65°, the external temperature being 82° in the shade. I then recharged the cooler with ice and salt as before, and thirty-eight minutes after the beer stood at 58°."



HOERR'S COOLING ATTACHMENT FOR BARRELS.

THE CASSON-DORMOY FURNACE.

The accompanying engraving represents a highly successful gas puddling and mechanical stoking furnace, known as the Casson-Dormoy furnace.

This furnace has a gas producer in lieu of the ordinary grate. The puddling chamber is perfectly circular, the sides and bottom plates being so arranged as to expand and contract with the variations in the temperature of the furnace.

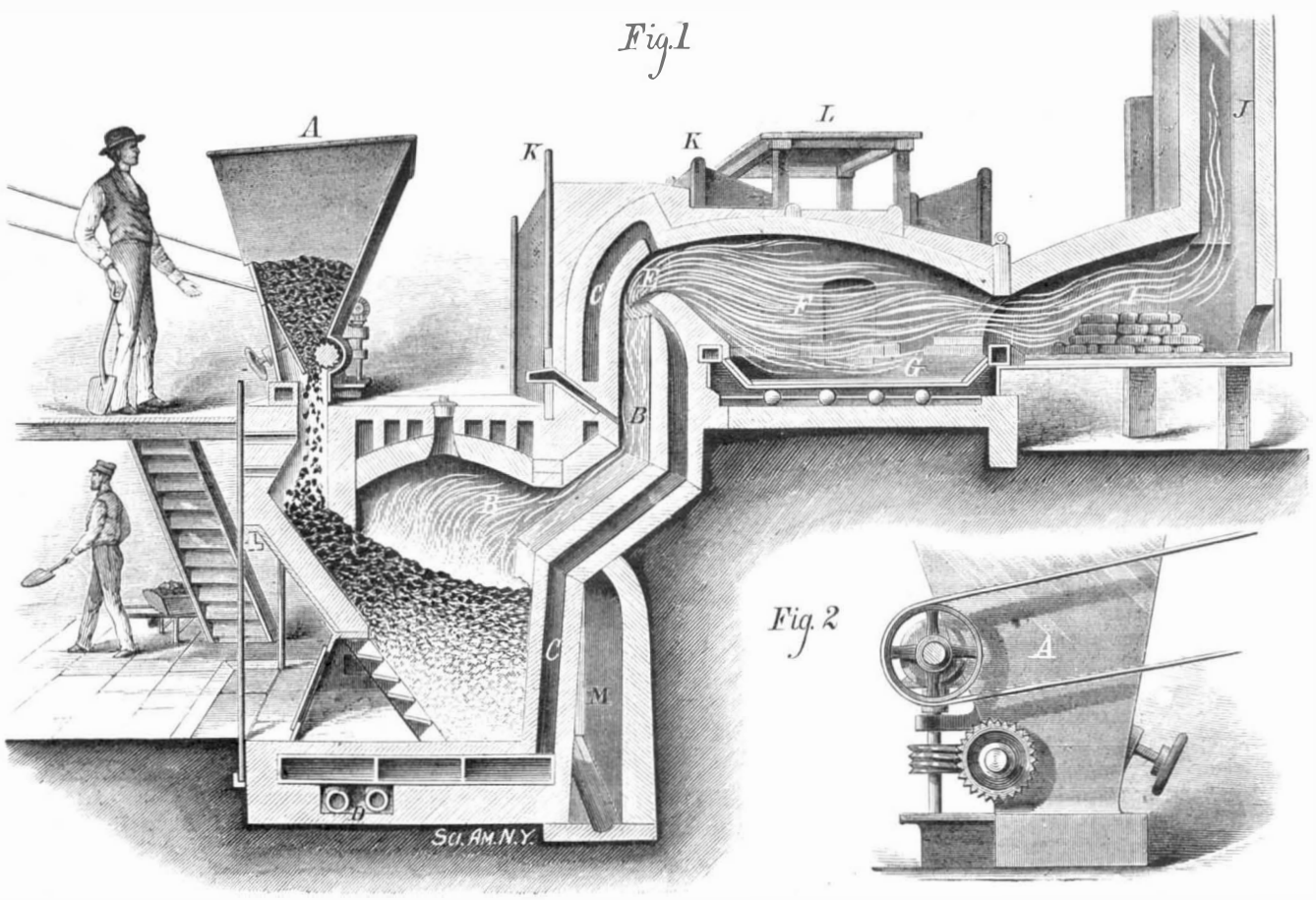
The gas producer, B, is constructed similar in form to the "Siemens," but instead of the air being heated in a "regenerator," it is drawn or blown down the sides of the furnace chimney or flue, and under the bottom crown and walls of the producer, the gases being fired at the bridge; by this means a temperature of about 800° is obtained. The condition of the furnace is completely under the control of the puddler, who, by arranging the blast valves, obtains either an oxidizing or reducing flame, as the condition of the iron may require. The producer is fed from a large hopper, A, filled with slack. At the lower end of the hopper there are 2 revolving drums driven by a ½ H. P. engine, thus dispensing entirely with manual feeding. The feeding mechanism is shown in detail in Fig. 2. By means of dampers fixed in the gas flues, C, the producer can at any time be disconnected from the puddling chambers; this is done every Saturday, or holiday times, and causes the necessity of relighting the producers. At Round Oak Works the producers have remained three weeks without any feeding, and have been nine months without being put out.

The puddling basin, G, rests on a brick pillar 1 foot 4 inches from the ground. On this is set a wrought iron circular open dish, with sides about 4 inches deep; within this dish eight or more friction balls, 5 inches diameter, are placed at equal distances from each other. On these spheres two cast iron semicircular plates are laid; on these plates again four side or segment plates are bolted together externally by means of wrought iron pins, and forming a complete circle. Upon these are placed loosely the shelf or table plates which rest upon brackets fixed to the rail. Buckstaves, K, support the walls of the furnace. All the plates forming the basin are thus free to expand and contract with the variations in the temperature. The dish below being kept full of water, the evaporation produced from the above efficiently cools the bottom and sides and consequently the fettling. By the absence of inequalities and corners its shape does away with the difficulties usually attending the working of a mechanical rabble, at the same time effecting a considerable saving in fettling.

The circular form of basin easily enables the rabbling to be worked by machinery, as there are no jambs that the rabbles cannot reach in their courses from right to left and back again.

The pig-heating chamber, I, is fixed between the puddling basin and the chimney or boiler, and besides serving as a neck to the furnace, heats the pigs preparatory to their being passed over the bridge into the furnace.

When the iron is ready to ball the heating chamber, I, is charged a few pigs at a time; when all the balls are drawn out of the puddling basin, G, these pigs are passed over the bridge, and as soon as they are melted, the rabbles, which are so set that they cannot catch into each other in crossing, are fixed to the machine and worked at a slow motion for about five minutes; the speed is then quickened until the iron boils, when the slower speed is put on till the iron drops. The heating chamber, I, is then charged. The rabbles are then removed, and the real work of the puddler begins by his balling up the iron in the usual manner. The balls, which are of the ordinary size, are drawn from each door and the cinder tapped. A few shovelfuls of hammer slag are thrown on the bed, and the pigs, which have meanwhile been supplied into the preparatory chamber, are again passed over. These generally melt on the bed in ten minutes or a quarter of an hour. The charges of about 13 cwt. usually take from an hour and twenty to an hour and thirty minutes.



THE CASSON-DORMOY GAS PUDDLING MACHINE.

New Mechanical Inventions.

Mr. John F. Cameron, of New York city, is the inventor of an improved Air Ship or vessel, which is claimed to be so constructed that it may be propelled and guided through the air horizontally, or at any desired angle up or down, while carrying passengers and freight.

Mr. Floyd Heavener, of Laramie City, Wyoming Territory, has patented an improvement in Clothes Line Reels, designed to wind up the clothes line when it is to be taken into the house, and to stretch the same taut when disposed for use.

Mr. Patrick H. Childress, of Waynesborough, Va., has patented an improved Millstone Driver. This invention relates to an improvement upon the millstone driver for which letters patent were granted the same inventor August 13, 1878, in which the driver was made in two pivoted sections, and their inner ends jointed together by forks formed upon the said inner ends of the driver sections and an interposed ring which encircled the spindle.

Mr. Eugene Vicaire, of Paris, France, has invented an improved Device for Transmitting Motion, which is designed to destroy the effect of the inertia of the moving parts. It consists in a peculiar form of compound beam or lever provided with a counter weight.

Mr. Henry Pollock, of Fredericton, New Brunswick, Canada, has patented an improved Thread Cutting Attachment for Sewing Machines, by which the thread may be cut quickly. The cutter may be instantly lowered below the table when not required for use.

Mr. John F. Seymour, of New York city, has devised a novel Machine for Drying Sheets of Postage Stamps and other gummed paper or material, which saves the time, labor, and space required when the gummed sheets are dried in the usual way.

An improved Automatic Car Coupling, that may be coupled without going in between the cars, the coupling link being held in the exact position for entering the connecting draw head, and adapted to couple with draw heads of cars of different heights, has been patented by Mr. Charles W. Cornell, of Wauseon, Ohio.

Mr. Henry Staib, of Blossburg, Pa., has patented a Machine for Finishing or Rolling Leather, which will permit the operator to control the pressure and apply the most power when it is needed—that is, at the time of greatest pressure. It will let off and free the leather from the operating rollers instantaneously.

Mr. William H. G. Savage, of Kingston, Ontario, Canada, has devised an improved Permutation Lock, in which the adaptability of the face plate in connection with the set screw furnishes a very simple means of setting the lock to any desired combination, and changing the combination to a new one whenever necessary.

Mr. Ephraim R. Dingley, of New York city, has devised an improved Railroad Track, in which the rail is provided with a concaved rubber bearing block, extending around and over one side of the head of the rail, to destroy the side vibration of the rail and the ringing sound of the car wheels.

Mr. George W. Prescott, of Battle Creek, Mich., has invented an improved Cone and Fastenings for Smokestacks of Locomotive and Portable Engines. It is so constructed as to break up the cinders and prevent them from cutting the netting and smokestack without impeding the exhaust.

Mr. Asa E. Stratton, Jr., of Brazoria, Texas., has patented an improved Car Axle Bearing, which consists in a box having a chambered back for containing oil, and having grooves along the straight edges of its bearing surface for receiving a wick, the ends of which extend through holes in the box into the oil reservoir.

Mr. Edward Huber, of Marion, Ohio, has patented an improved Feed Water Heater, which consists in the peculiar construction and arrangement of a circular jacket, arranged about the smoke chamber of the boiler, having a supply pipe and a discharge pipe leading to the boiler, so that the water, in passing through said jacket to the boiler, is not only heated before being delivered into the boiler, but also serves to prevent the smoke chamber from being burned out.

Mr. Thomas Whitfield, of Chicago, Ill., has patented an improved Apparatus for Filling and Capping Capsules, by which capsules may be readily filled with a graduated amount of powder and securely capped at the same time.

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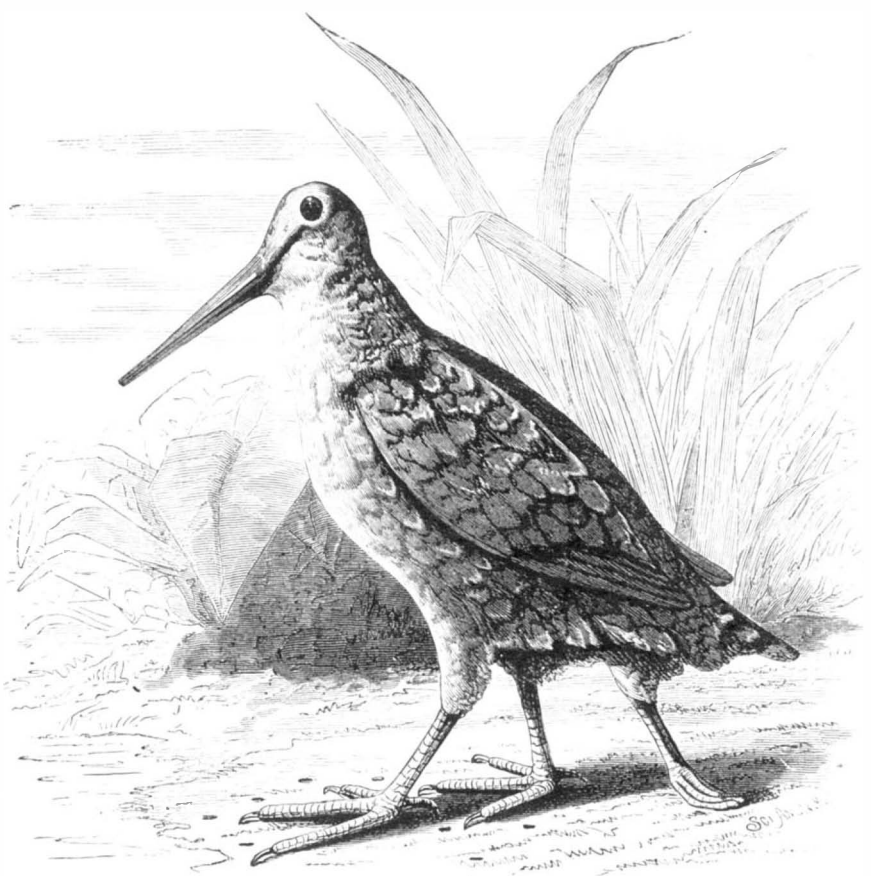
A THREE LEGGED WOODCOCK.

It is rare that monstrosities in nature are ever able to hold their own in the struggle for existence. An exception appears, however, in the illustration herewith: a three legged woodcock, shot by Mr. Jules Reynal, near White Plains, New York, last September. The third leg was attached just below the vent, and dragged, as shown in the cut. It appears to have been in reality two legs in one, the double bones showing quite clearly, and the six toes being distinct and nearly perfect. The bird has been sent to Professor Baird, of the Smithsonian Institution, from whom we hope to receive an account of the internal anatomy of this curious freak of nature. The bird when shot was well grown and in good condition.



A THREE LEGGED WOODCOCK.

Experiment with Carnivorous Plants.

To test fairly and on a large scale the conclusions arrived at by both the venerable Charles Darwin and his son Francis, with respect to the benefit derived by carnivorous plants from the insects they destroy, Mr. Peter Henderson, of Jersey City, has tried the following experiment. He procured, in March, from Keenansville, North Carolina, a large number of *Dionœa muscipula*, which reached him in fine condition.

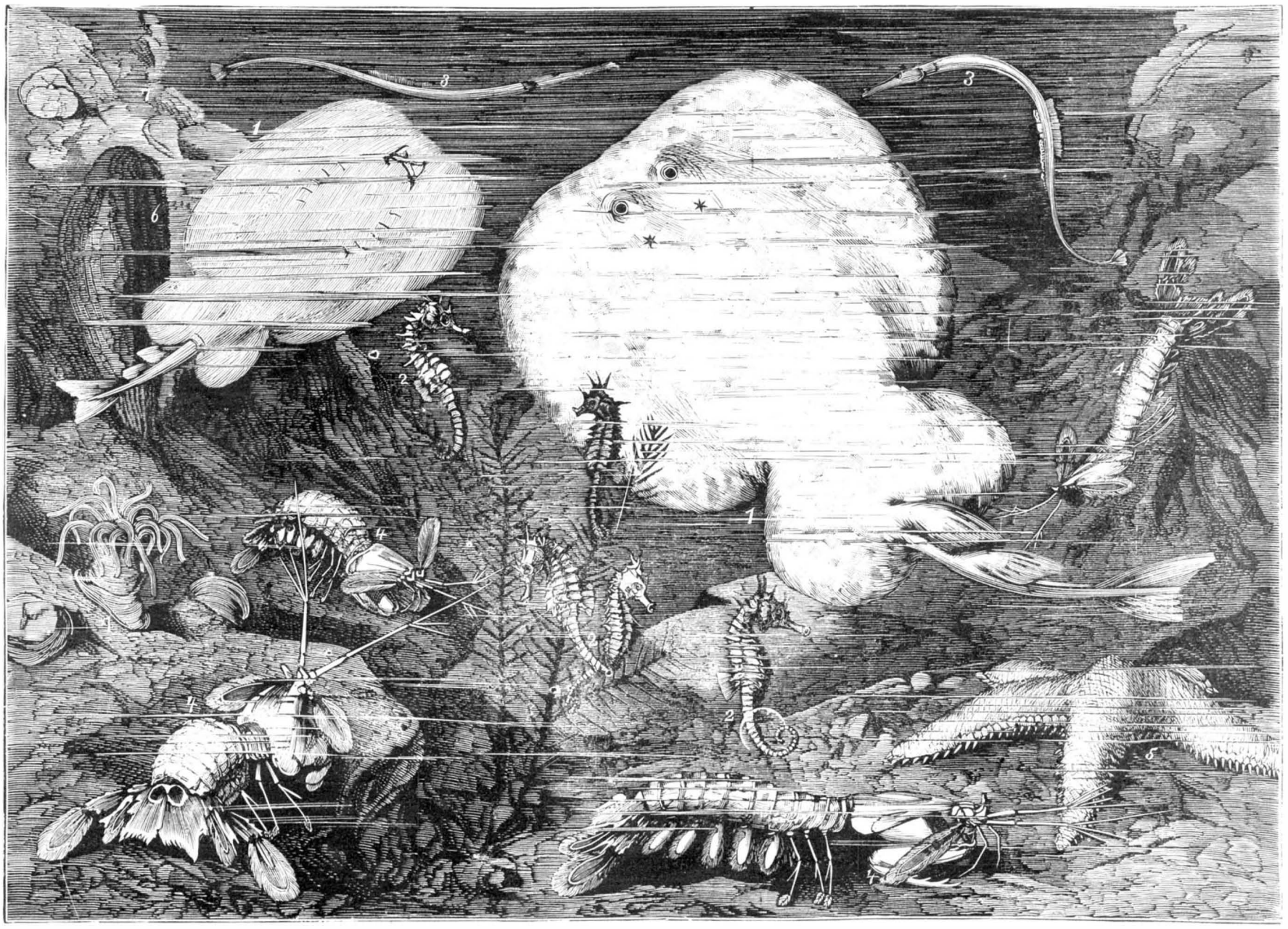
Selecting from the lot two hundred of the strongest plants, he thoroughly rinsed them in water, so that every particle of soil and all other matter foreign to the plants was removed. He then procured two boxes, three feet by three feet and three inches deep; these were filled with moss (sphagnum) and sand mixed, in about the proportion of four parts moss to one of sand, forming a soil somewhat similar to that which they had been growing in naturally; this compost had been also subjected to the rinsing process so as to clear it from impurities. One hundred of the fly-traps were planted in each box, the plants selected being as nearly alike as possible. After planting the boxes were each copiously watered with pure water and placed in a cool and partially shaded greenhouse. One box was covered with a wire netting, as fine as could be procured, so as to exclude insects; the other was left uncovered. By about the middle of May, two months after planting, the plants had begun to grow freely, and the "feeding" process was begun with the plants in the uncovered box. In this he was assisted by Mr. William Tait, one of his neighbors, a gentleman of leisure, and one who is well versed in many branches of natural science; between them the one hundred uncovered fly-trap plants were "fed" almost daily for three months with flies and other insects. In August, three months from the time the feeding began, the operation was stopped, and the most careful examination and comparison failed to show the slightest difference between the one hundred plants that had been "fed," and the one hundred (under the wire netting) that had not been "fed." Both lots had made a splendid growth, and were the admiration of scores of visitors. Mr. Henderson never omitted an opportunity to ask professional horticulturists for their opinion, and the verdict invariably was that both lots were identical, as near as could be. In this case the "feeding" certainly did not fatten. "It may be," Mr. Henderson remarks in the *Gardener's Monthly*, "that our American flies were not so nutritious as the English 'meat,' though certainly ours was the more natural food of the two; but, as corroborating the test of Mr. Darwin, it failed."

STUDIES FROM THE BRIGHTON AQUARIUM.

To wander at ease among the many strange and beautiful forms of life which animate the world of waters, watching the mysterious habits and doings of creatures as different as they well can be from those with which we are most familiar, is a pleasure and a profit which have been reserved for our own times, and which can be nowhere more conveniently or completely studied than at the Brighton Aquarium. In our engraving different subjects are indicated by numbers, as follows: 1. Electric ray fish. 2. Sea horses. 3. Fife fish. 4. Bear crabs. 5. Star fish. 6. Muscle. 7. Anemones.

Remarkable Mortality of Fish.

The extraordinary phenomenon displayed on the Florida coast, by which not only the coast waters, but as far out as 150 miles into the Gulf, have been rendered so poisonous as to kill the fish and create a pestilential stench in bays and harbors where the floating carcasses collect, should receive a thorough investigation. We have seen no other explanation of the poisoning than that it comes from inland waters—the everglades prominently—and penetrates the Gulf in strata of dark reddish water, which kills all the surface fish as soon as it reaches them, and even far beyond any apparent contact. This poisonous outflow is stated to have been nearly fatal to the fish trade between Florida and Havana—the smacks finding it almost impossible to select a route in which the fish in their wells are not destroyed by the poison. The Key West *Key* says: "The smack George Storrs, Capt Zeb Allen, attempted to run to the westward in hopes of escaping the deadly waters, and when 50 miles west of Tortugas, in 25 fathoms of water, lost its whole fare of fish in a very short time. He describes the poisoned water to the south and west of him as far as he could see." Fifty miles west of the Tortugas would make the locality indicated 150 west of Cape Florida, and not very far from mid-gulf.



STUDIES FROM THE TANKS OF THE BRIGHTON AQUARIUM.

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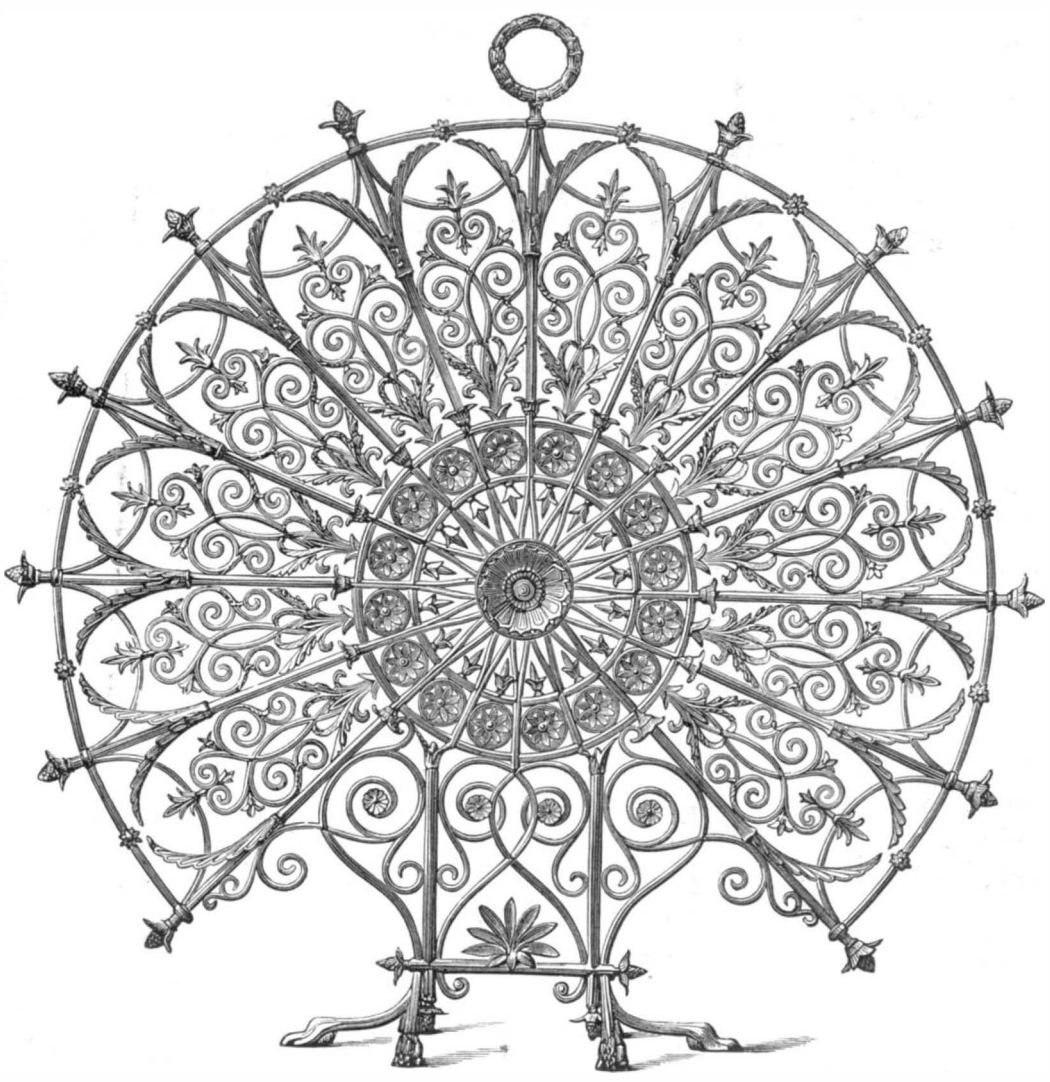
The Orange Trade in New York.

With the holidays come the oranges, and since the season promises to be an exceptional one, it is estimated that between now and New Year's 50,000,000 oranges will be sold in this city. Already the fruit departments of Fulton and Washington markets are glutted, and by one steamer due in port to-day 300,000 oranges, by another 3,000 barrels, or 1,000,000 oranges, and by another 350,000 in bulk are expected. The barrel stock, nearly all of which comes from the West Indies, and the case and box stock, mainly from Mediterranean ports, are consigned to shipping and commission houses, by whom they will be distributed among the trade. The stock in bulk, however, partly from the West Indies and partly from Florida, is sold in quantities from one barrel to 1,000 barrels at the docks, as potatoes and other home products are sold at the foot of Vesey and West Thirty-fourth streets. One whose inferences with reference to the local orange trade are drawn from an inspection of the business exhibits which dealers put forth to tempt the small buyer has but a superficial and erroneous notion of the risks which encumber it. To say that the fruit is perishable, as the term is usually understood, is an inadequate expression of the extent of that risk. There is no product so perishable. Of about two hundred million oranges received here last season—from September until March—nearly eighty-three millions perished, or 40 per cent of those received from the Mediterranean ports and 46 per cent of those received from the West Indies. The loss on a cargo of 200,000 oranges from Dominica was 159,600, or 79 per cent; on eleven cargoes from Mayaguez, comprising 2,654,590 oranges, 1,495,120, or 56 per cent, and on a cargo of 230,000 from Ocho Rios, 210,000, or 91 per cent. In many cases the amounts received from the sales of cargoes were insufficient to pay the charters of the vessels. Until within three or four years the trade was conducted mainly by importers, but they soon learned the lesson which the figures just given convey, and many of them were ruined in the learning. Of about fifty then engaged in the business in the city only three remain, nearly all the others having become commission merchants only. No better opportunity to appreciate the trade, stripped of its glamour, could be had than by boarding to-day or to-morrow the sailing vessel which will be moored at some of the docks near Burling slip, with stock in bulk, the vessel having on the way from the West Indies encountered two tornadoes, which are especially disastrous to the preservation of the fruit. The stock, when sold, will be carried to store rooms or cellars, out of sight, and there sorted after the approved fashion best known to the trade, by a process so highly scientific, that the best that is saved and the worst, after the usual polishing and drying, would never be recognized as having originally belonged to the same lot. Stock received in bulk is generally considered inferior in quality to that received in barrels, boxes, or cases, although it is no more perishable. At present, there is a furor over Florida fruit, which is rarely received in bulk. Ever ready to accommodate the public taste, small dealers have provided themselves abundantly with paper labels, and it is almost impossible for a retail buyer to find any other kind of fruit. John Marsh, who sells for Darrell & Co., importers of the Mandeville (Jamaica) stem cut oranges—a large, solid, bright colored fruit—and who has a large trade among the Fulton and Washington market dealers, says that the best imported fruit is labeled as coming from Florida to meet the popular demand. The receipts of this season have thus far been much larger than they were at this time last year, although the West India trade has suffered from violent storms, and is likely to fall short of the average yearly importation.

"I was offered a few days ago," said a large dealer yesterday, "the use of two of the best estates in Jamaica, where the fruit may be had in any quantities for the gathering, but I wouldn't hear of the offer. By accepting it I could deliver the best oranges in the world in New York for less than $5 a barrel. The best sell for $10 a barrel—from 320 to 340 in a barrel. When I was younger in the business I thought I could make money in that way. I stood on the wharf for three months and lost $10,000 on account of the waste by rot. That is why I didn't accept last week's offer."
—*New York World.*

BRONZE LATTICE OR FIRE GUARD.

The accompanying engraving represents an elegant bronze lattice or fire guard, designed by H. Claus, and manufactured by Messrs. D. Hollenbach & Son, of Vienna.



BRONZE LATTICE OR FIRE GUARD.

The Last Eruption of Mount Vesuvius.

A sketch of the crater of Mount Vesuvius, as it appeared during the recent eruption, has been sent to us by our esteemed correspondent, A. Ricco, Professor at the University of Naples, who visited the crater on the 10th of November last.

"The view on the crater," he says, "is extremely beautiful and imposing. The crater has undergone considerable changes since the eruption of 1872. It now presents the form of a large amphitheater of about 1,200 feet in diameter and 100 to 150 feet deep. The bottom is formed of lava which has only superficially hardened. In some places the crust is hard and thick enough to allow walking over it, at other places it is yet quite soft. The surface is full of cracks and holes, from which dense masses of smoke are constantly issuing. The lava on the sides of the crater is soft and so plastic that it readily receives impressions from coins, etc. In the center of the crater rises a small cone, about fifty or sixty feet high; it is covered with incrustations containing many shells and different species of mosses. Looking through the cracks in the side of the cone and floor the incandescent lava may be seen, the aspect resembling a labyrinth of fiery paths, running over the bottom of the crater in all directions. At short intervals the mouth on the summit of the cone sends forth a gigantic column of smoke and fire, which is plainly visible from the city of Naples, miles distant. Near the base of the cone a second mouth has been formed, from which lava and smoke constantly issue.

"As the inclined position of the crater tends to send the lava and smoke constantly in one direction, the crater may at present be visited with comparatively little danger."

Look to Your Fireplaces.

From what occurred the other day in Boston, according to the *Daily Advertiser*, it is wise for residents of new houses that they should keep close watch of the fireplaces during their first trial. The fire in the Roberts mansion on Beacon Hill, which was about three years in building, and had the immediate supervision of an architect, is an item of grave astonishment not only to the underwriters, but to the owner. Two days previously a fire was started in one of the open grates for the first time, and not burning freely was dumped upon the hearth. From that moment there was a smell of smoke in the apartment, when, as above noted, it was discovered that the hearthstone rested upon a beam which ran directly across the fireplace. About three feet of this beam was burned off. Three other Boston fires from open grates are noted within a fortnight. A South End resident had an attractive soapstone fireplace, and, purchasing a pair of andirons, started an old-fashioned wood fire, to find that his fireplace was only a ventilation, and his blaze burning in behind the plastering up through his house. Another case similar was the Marlborough street fire in October, where a single course of brick for a hearth resting upon the beams was no protection, and a marble slab for a hearth lying upon the under floor being overheated set the floor afire.

Iron Wood Screws, etc.

No recovery can be reported as yet, says the *Ironmonger*, in this important and once flourishing branch, which continues very quiet under the combined influences of over-production, American and French competition, and the depression of the building trades.

The introduction here in 1854 of patent self-acting machinery from the United States, continues the same English paper, has increased the local production probably fivefold, and it is not to be wondered at, therefore, that in times of dull trade like the present the industry should be in a somewhat suffering state. Westphalian wire, which is being imported by thousands of tons yearly, is fast superseding English wire for screw making purposes.

The Birmingham Screw Company, who produce in ordinary times some 60 to 70 tons weekly, find the Westphalian wire, or English wire drawn from Westphalian rods, equal, if not superior, for screw making purposes, to any article in the market, and at considerably less cost than native iron. The great difficulty English screw makers have to contend with just now is the French and American competition. Messrs. Jappy Frères have now got a virtual monopoly of the French and Italian markets—thanks, in some measure, to protective tariffs; and as the German screw makers are also very active, there is not much opening for English screws in the continental markets. The Americans, however, are at present our most formidable competitors, not only in Canada and the colonies, but in this country, where, there is some reason to believe, they are selling under cost price.

Since the recent auction sales of screws, which were professedly intended to relieve stocks, but which were manipulated in such a way as to enhance the market value of those stocks by bogus purchasers at high prices, the American screw makers have altered their discounts so as to advance prices, on the net, about 12½ per cent, and as this advance gives them the required profit on their home sales, they can afford to send their surplus stocks into this and other markets at something under cost price. This is understood to be the policy of the American Screw Company, who make a specialty of the "taper" bodied screw, and manufacture some 4,000 varieties, and this will explain the low prices at which American screws are being delivered now in Liverpool. A new variety of screw, now being offered to English manufacturers, has been newly adopted by Jappy Frères for France. Its peculiarity consists in this, that the bottom of the groove, or slit, in the head of the screw, instead of being straight and level, rises in the center to an apex nearly flush with the surface of the screw. This necessitates, of course, the employment of a special form of driver with V-shaped edge to fit the bottom of the slit. The object is to strengthen the head of the screw, which is sometimes so much weakened by the slit as to break off under the pressure of the driver, but the proposed remedy is generally regarded here as worse than the evil, and it is not likely to be adopted.

Cost of the Yellow Fever.

Loss of life by yellow fever in the South last year is estimated at about 15,000 persons, and of money and trade at from $175,000,000 to $200,000,000—as great as the loss from the Chicago fire. But some good is likely to come out of this calamity. It is thought that henceforth quarantine regulations will be more thoroughly established than they have ever been. Apart from death and human suffering, negligence is the worst kind of political economy. Expenditure of one-twentieth part of what the fever has cost might have prevented it altogether.

The Catalpa.

Professor Burrill, of the Illinois Industrial University, says that from experiments performed at that institution, the catalpa is found to be one of the cheapest and earliest trees to grow, and one of the most rapidly growing of our forest trees, native or introduced. Its growth has been surpassed only by the white willow and soft maple, among the various trees tested in the last eight years. It has outgrown the American elm, white ash, European larch, Osage orange and black walnut, on the same ground, and under the same treatment. It is not attacked by any insect. The young trees were set two feet by four, cut back and cultivated like corn for three years, and plowed one of the two succeeding years. This was good management. The trees are now large enough for half to be thinned out. The average height is more than sixteen feet; they are straight and erect.

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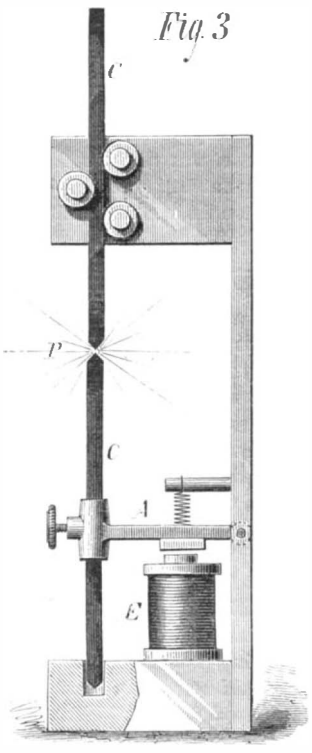
ELECTRIC ILLUMINATION.

BY JOHN TROWBRIDGE.

In the subject of electric illumination America is far behind Europe at present, unless there may be some great invention about to issue, with the seal of the Patent Office, which shall give her the lead. This inferiority is not alone in the number and variety of the lamps before the public, but also in the forms of dynamo-electric machines. On the continent of Europe we find several forms of the Siemens-Halske machines; the Gramme machine and its different species, of which Schuckert's is a notable type; the new Gramme alternating machine, which is almost indispensable in the regular consumption of carbons used in electric lighting, and the Lontin machine. The horse power seems to be less per light with the use of the foreign machines than with the American, if we can judge from the measurements made public; and less velocity is required to run the machines, which is a great desideratum. America has not given to the world a regulator which is as efficient as the Serrin lamp. The foreign carbons are better than those of American make, and the process of electroplating them with copper or other metals, in order to prevent their heating so far below the point of burning, has long been known in France. The Brush lamp and the Wallace lamp are the prominent lamps before the American public, and answer very well for purposes of general illumination. There are not more than a dozen establishments in America which are lighted by electricity, while there are hundreds on the continent. Lighting by incandescence has not hitherto been successful either by the use of carbons in receivers exhausted with air or filled with nitrogen, or with platinum or iridium wire, or platinized asbestos. The carbons disintegrate or crack after a time, and the metals fuse. Both of the above methods—that by carbons and that by incandescent wire—have been tried in Europe and have been proved to be more expensive than the use of gas.



The great attention that is being paid to the so-called divisibility of the electric light is evidenced by the number of new lamps that appear from time to time. Messrs. Siemens and Halske, the owners of the Siemens dynamo-electric machine, have patented eight forms of lamps; among the most noteworthy are the following:

Fig. 1 represents a form in which the carbons, C C, are separated by the rod, R, which is moved by means of the lower arm, A, which is set in action by the electro-magnet, E. When the current passes through the electro-magnet, E, and the carbons, C C, the rod, R, which is made of a refractory substance, thrusts the carbons apart. If the current should decrease in strength, the carbons fall together again, and the current is not broken by any similar lamp on the circuit failing to perform its function.

In Fig. 2 one carbon is set in oscillation or vibration by means of the lever arm, which is terminated by an iron cylinder which forms the movable core of the electro-magnet, E. This carbon has to vibrate merely 32 times a second to cause the appearance of a steady light at the point, P. This lamp also admits of many lights in the same circuit.

Fig. 3 represents another form of the same idea. The upper carbon falls gradually upon the lower one, which is set into vibration by means of the lever arm, A, which is set in action by the electro-magnet, E. The lower carbon moves so quickly that the upper carbon, which is forced down merely by its own weight, cannot sympathize with it, and a small voltaic arc is therefore produced at P. The fluctuations of this arc are so rapid that they are said to produce no apparent alternation in the light. This lamp has also been invented in this country by Professor Thurston, of Philadelphia.

With the lamps above described a continuous circuit can be maintained even if one lamp should, from any cause, be extinguished, which is not the case when the Jablochkoff candle is used; for the poorly conducting medium employed in the latter prevents the re-establishment of the current when the light is extinguished. It does not appear, however, that these vibratory lamps have been put to practical tests.

A Substitute for Pens and Ink.

A German named Schwanhäuser has invented a sort of pencil which he calls a "Universal Tintenstift," which possesses all the advantages of both ink and pencils, but is quite unlike the aniline marking pencils once introduced into New York. It is deep black without containing any graphite, can be copied by a press just as copying ink can, yet does not fade in sunlight as aniline inks do. The method of preparing the mass is as follows:

Ten pounds of the best logwood is boiled repeatedly with 100 pounds of water, and the decoction evaporated down to 100 pounds. This liquid is heated to boiling in a porcelain dish, and nitrate of chromium added in small quantities until the bronze precipitate that forms at first dissolves again with a deep blue-black color. It is then evaporated on a water bath to the consistency of an extract, and finely elutriated fat clay mixed in, so that there is 1 part of clay to 3 or 3½ parts of extract. A little gum tragacanth may be added according to the hardness desired.

It is very necessary to observe the right proportion of chromium salt to logwood extract, for an excess makes it write badly, while too little changes the solubility of the black compound. No other salt of chromium is suited to the preparation of this mass, as they are all crystalline, and on drying the crystals make it brittle.

The nitrate of chromium is prepared as follows: Dissolve 20 pounds chrome alum in 20 pounds of boiling water, and add slowly to this solution enough carbonate of soda, also in solution, to precipitate all the chromium as hydrated sesquioxide. After this bluish-green precipitate has settled the liquid is poured off and the precipitate washed until it is free from sulphates of soda and potash, as found by testing the wash water with acidified chloride of barium solution. The precipitate is brought upon a filter, and pure hot nitric acid, diluted with an equal part of water, put on slowly, so that upon boiling a long time a small excess of the oxide still remains undissolved. In this way a perfectly saturated solution of nitrate of chromium is obtained free from excess of acid, which would be very injurious to the logwood extract, producing a dirty red color.

Another advantage of using the nitrate is that no basic salts are formed when excess of acid is present, as in the case of most other chromium salts. These basic salts would precipitate a greater part of the coloring matter from the logwood extract.

It is claimed that it dries quickly, so that blotting paper or sand are unnecessary.

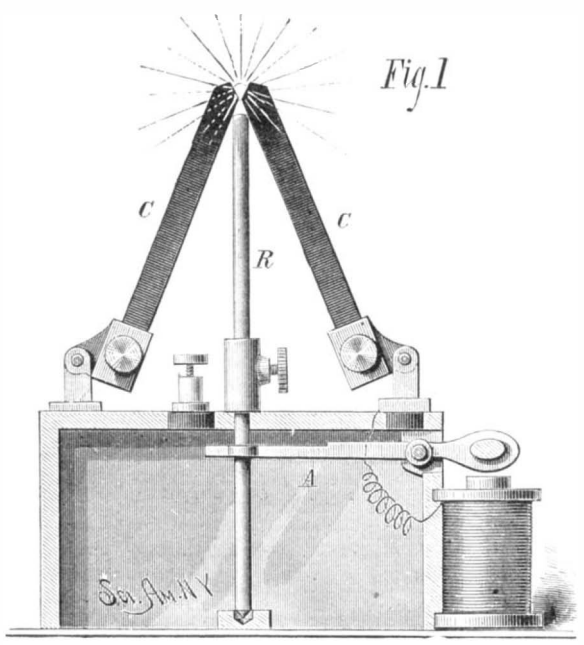
The written ink is indifferent toward caustic alkalies; dilute nitric acid colors it reddish without diminishing its intensity. It is not affected by oxalic acid, which destroys ordinary iron inks. The pieces cut off in sharpening the pencil can be thrown into water and used as ink with a common pen.

New Inventions.

An improvement in Water Gauges for Steam Boilers has been patented by Mr. Erastus B. Kunkle, of Fort Wayne, Ind. This invention consists in scrapers or cleaners formed upon the valve stem of the water cock, to free the cock from scale. The valve has a vacuum chamber at the outer end of the water cock, to prevent the escape of hot water around the valve stem.

Mr. John D. William, of Rising Sun, Ind., has patented a Burglar Alarm, which is an improvement upon that form of burglar and fire alarm in which a clock mechanism is set going and made to ring a bell from the movement of a tripping device, which is released when one of a number of cords running to the various parts of a house is burned by fire or disengaged by the entrance of a burglar.

Mr. Robert W. Tavener, of West Bay City, Mich., has patented an improved Lubricator or Oil Cup, designed to be attached to the steam chest of a locomotive, and depending

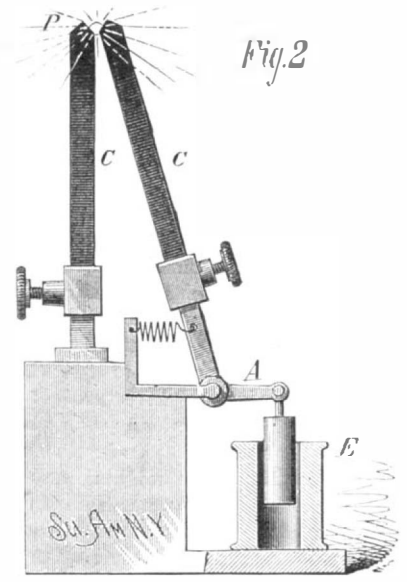


for its automatic feed or operation upon the intermittent injection of steam into it. The cup is provided with valves for admitting steam and permitting the exit of the oil, and also for facilitating the discharge of sediment.

Mr. Wilson E. Facer, of Cleveland, Ohio, has devised an improved Electric Gas Lighting Apparatus, which, by the simple opening and closing of an electric current, turns on and lights the gas or shuts it off. It is designed principally for lighting street lamps, but is capable of application to other purposes.

A Curious Surgical Operation.

The success of the experimental researches of Odlier, Patterson, and others, in regard to the transplanting of various organic tissues, lately led to a remarkable experiment in practical surgery. The case is reported at length in a recent number of the *Lancet*. A marine engineer had broken both bones of the left forearm, a little above the wrist. The arm was kept in splints for some weeks, but the bones refused to unite. Eight months elapsed before the man reached land, and then he entered the Glasgow infirmary for treatment. Three separate operations of setting the bones were performed, and all failed to secure a union. A year and a half after the accident the man returned to hospital to have an amputation performed, the hand and lower part of the arm being useless. Although amputation was unanimously recommended by the surgeons, Dr. Patterson was granted permission to try any plan he chose to save the limb, and accordingly planned the following operation:



"The patient was, on the 14th of September placed under the influence of chloroform, while at the same time a retriever dog was being anæsthetized. Cutting down upon the ends of the fractured bone, and removing the fibrous band which alone formed the bond of union, the rounded points were removed by the saw, and a hole drilled obliquely through each squared end. This process was repeated on both sides of the arm, when it was found that an interspace of about ¾ of an inch existed between the two fragments. In the meantime, one of the senior students, and a very clever manipulator, had exposed the humerus of the quadruped completely denuded of every tissue except the periosteum. The length of the bone was accurately measured (¾ of an inch), while from half an inch beyond the end of the necessary length the periosteal covering was rapidly but carefully dissected, the bone sawn through, a hole drilled in either end obliquely, as in the bone in the arm, where it was at once placed and fitted accurately. Wires having been passed through the holes, the bones were firmly tied together. The wound was stitched with silver wire, the bone sutures coming out at each end of the incision. The entire operation was conducted under the carbolic acid spray. The arm was put up in gauze, and held in two rectangular splints.

"After the operation there was a slight tendency to sickness, which was relieved by ice. On the 15th the wound was dressed, and one or two of the stitches removed, as there were signs of tension and a slight blush around the sutures. Tincture of opium (25 minims) was given to induce sleep.

"By the 3d of November a union had taken place, and the wires were removed on the 28th of the same month. The fracture then had all the appearance of being firmly united, and the patient was dismissed, with orders to return weekly for dressing and examination. On leaving the hospital boracic lint was used as dressing. One small wound remained open for twelve months, when the dog's bone, reduced to about half its size, came away, after which the wound healed completely. Shortly after this the patient resumed his former occupation, at which he is still engaged. He remains in perfect health, and retains a very useful arm."

Dr. Patterson says that he had some hope that the strange bone might have found a new home in the man's arm; failing that, he was sure it would secure perfect alignment of and steadiness in the ulnar fragments. Should a similar case occur he would adopt the same process, still hoping that the two bones might become one.

Effects of Food upon the Bones.

Experiments made by Lehmann upon young animals showed that food containing an insufficient amount of phosphates not only affects the formation of the skeleton, but has an essential influence upon its separate parts. A young pig was fed 126 days upon potatoes alone, and it had, as a result of this insufficient food, *rachitis* (rickets, or softening of the bone). Other pigs, from the same litter, fed upon potatoes, leached-out meat, meal, and additional phosphates, for the same length of time, had a normal skeleton. Yet even in these animals there was a difference according to the kind of phosphate added. Two that were fed on phosphate of potash had porous bones, specifically lighter than the others, which were fed upon phosphate and carbonate of lime.

GOOD SAUSAGES.—The following is a time-honored recipe of excellence which, at this season of the year, may be found useful: For 30 lbs., of meat, chopped, add ½ lb. fine salt, 2½ ozs. of pepper, and 2 teacups of powdered sage, sifted.

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THE MANUFACTURE OF SOFT FELT HATS.

Before the general introduction of machinery into the trade, the various processes involved in making hats, from the forming of the bodies to the trimming and lining of the finished article, were performed exclusively by manual labor Then, the manufacture of a hat was a slow and tedious operation, requiring a large amount of expensive, skilled labor, thus making a good fur hat a luxury entirely out of the reach of the laboring classes. Now, by the use of efficient machinery, the process is short and the cost reduced to a small percentage of that previously charged for the handmade article.

The finest quality of felt is made from the fur of small soft haired animals, especially the Russian hare or cony, the fur of which is imported into this country in immense quantities. It is shaved close to the pelt in order that the hair may be as long as possible, and shipped to the hat formers in small bundles of a few pounds weight each.

The quality of felt desired being determined upon, various grades of fur are thrown together and passed through a "mixer" as it is technically called. The fur is fed into this machine by an attendant, and is brought in contact with a toothed cylinder, revolving rapidly, which tosses it into a large box covering the machine, and thoroughly mixes the different qualities. It still contains, however, a great many impurities, bits of pelt, and matted fur, which are to be removed by "blowing." The "blowers" are contained in a long wooden case having a cover of fine wire netting, in order to allow the dust to escape. The mixed fur is fed between two rollers upon a cylindrical picker, which, making several thousand revolutions a minute, throws the heavy impurities down upon a screen and sends the light fur up in the cover, from which it falls upon a moving apron only to be delivered to another pair of rollers, when the operation is repeated. Each case contains several blowers, and when the fur finally emerges, it is perfectly uniform and exceedingly light and soft. It is now ready to be made into hat bodies, and is carefully separated by weighing into equal amounts, each of which is sufficient for one hat.

The forming machines consist of a large sheet copper cone, two feet long, with a hemispherical top, pierced full of small holes, and standing upon a slowly revolving circular table. This cone is covered by a hinged case of the same shape, but with an open top and of such size as to leave a space between it and the cone. The fur, falling through the opening, is sucked tightly down upon the cone by a powerful exhaust far under the revolving table. The case is thrown open, cloths wrapped around the felt body, and a tight fitting perforated tin case placed over the cone. The whole thing is now immersed for about two minutes in a tank of boiling water, which "felts" the fur sufficiently to allow the body to be stripped off and wrung out, after which it is folded and dried. At this stage the "form" is a long funnel shaped bag, thin and very slightly tenacious. These are delivered to the hat manufacturers, who turn out the finished article.

The first process in these establishments is to felt the bodies by manipulation, which shrinks the felt one half, doubles its thickness and makes it tough and resisting. Six men stand around a hexagonal table called a "battery," rolling and working the bodies until they have acquired the proper dimensions, frequently immersing them in a bath of boiling water set in the middle of the table. They are then placed in a vat of weak vitriol, which draws the fibers of hair together and makes the felt compact. After remaining some time in this bath, they are dried and the thin rough edges trimmed off.

That part which is to form the brim of the hat must now be stiffened. This is done by dipping it carefully into a solution of shellac and soda, afterward passing through a pair of wooden rollers which remove the superfluous liquid. While in this moist condition the body is machine blocked, which gives the general shape of the hat. The blocking machines consist of a frame holding a set of radial arms over a movable upright, which is capped by a circle of radiating pieces and worked by a treadle. The body being placed upon this block, is pressed into the upper mould, the operator changing its position until it is of the proper shape. Separate machines are used for blocking the crown and brim.

They are now colored by immersing for a short time in a vat of hot dye and then washed thoroughly in cold water. After being dried, each body is fitted tightly upon a felt covered block, which is then placed upon a slowly revolving spindle. The attendant fits a cone of fine sand paper upon a tapering plug, sets it in rapid revolution and presses it upon the hat. This process, called "pouncing," removes the projecting ends and irregularities of the hair and gives the belt a smooth, even appearance. In this operation as in blocking the body and brim are "pounced" separately, the machines differing slightly in construction. The hats are now taken by the finishers, who block them and give the perfect shape and smoothness of felt by ironing and hard pouncing. The linings and trimmings are sewed on by girls, and the hats are ready for market.

England Taking a Hint.

The *British Trade Journal* thinks "the late Paris Exhibition has developed some startling proofs of the ability of Continental and American rivals to produce articles equal to and in some cases surpassing those produced by this country, notwithstanding even that such manufactures have been regarded as our own specialties, and have hitherto been thought to be unsurpassable. Our manufacturers have brought back with them the knowledge that we have no insignificant rivals. Both master and workmen have been too prone to consider that 'a parcel of foreigners' could never turn out anything even approaching English goods; but our eyes are being rapidly opened, and if the lesson is taken to heart the Paris Exhibition may partly be credited with having taught us to respect the workmanship of other nations."

New Agricultural Inventions.

Messrs. Thomas J. Lindsay, David A. Lindsay, and William J. Miner, of Windfall, Indiana, have invented an improved combined Seed Drill and Corn Planter for drilling seed or planting corn in two or more rows at once. The machine may be used for drilling or for planting in hills at will, without changing the parts.

Mr. Curtis H. Warrington, of West Chester, Pa., has devised an improved Machine for Marking Land, which is so constructed that it may be readily adjusted to make the marks at any desired distance apart, which will allow the plows to be readily raised from the ground for convenience in turning around and in passing from place to place.

Mr. David Englar, Jr., of Avondale, Md., has devised an improved Guano Distributer, which consists in a cam-grooved cylinder, located and revolving in the hopper of the machine, and a clearer and discharge regulator, which project up through the bottom of the hopper, and are reciprocated horizontally as they follow the cam groove. The guano is removed from the cam groove by means of the clearer, and falls into the tube or spout, which conducts it into the furrow in rear of the hoe or shovel.

Mr. Washington H. Tucker, of Stone Fort, Ill., has devised an improved Trough for Feeding Hogs with any desired kind of feed, and which is so constructed as to prevent the hogs from wasting their food, from getting into the trough with their feet, or interfering with each other while eating.

Mr. David F. Hacker, of Kempton, Ind., has patented an improved Horse Hay Rake, which is automatic in its action, the teeth being raised by the wheels through a movable ratchet sleeve placed on the axle.

An improvement in the class of Force-feed Seeders and Planters having a gauge or regulator for increasing or diminishing the flow of seed at will, has been patented by Mr. Alonzo Runyan, of Catawba, O. In this machine the regulator can be easily set to any desired amount of feed, and it always indicates the amount of seed the wheel is delivering.

An improvement in Hay Elevators has been patented by Mr. Joseph W. Higgs, of Sharon, Pa. The object of this invention is to furnish a device for moving hay from the wagon to the mow in the barns. It is simple in construction, convenient and reliable.

Machinery.

The never-ending invention of mechanical and other contrivances for minimizing manual labor leads to the supposition that, by-and-by, the latter will be dispensed with altogether, and that human existence will become a state of sinecurism. If this consummation were ever to be obtained, however, it is pretty certain that life would become unendurable, and that mankind would soon cease to exist altogether. We have no apprehensions, says an English writer in the *Foreman Engineer and Draughtsman*, as to the arrival of either of the contingencies in question. Machinery will ever be the handmaid of humanity, but never its destroyer, and every real improvement made therein being only a new application of the forces of Nature, must be advantageous to the human family. No machine of any kind can possibly create power, and no combination of wheels, pinions, levers, belts, or cranks, however ingeniously arranged, will raise a single foot pound of power, or even one ounce. Suppose a watch be taken by way of illustration. In order to set it in action the spring must be bent and contracted by means of a key, and this imparts power from the muscles of the fingers. When the spring has given off the muscular force put into it the wheels and hands of the timekeeper come to a standstill. Again, in winding up an eight day clock you lift a weight of, say, 6 pounds, through 4 feet. In doing so you perform 24 foot pounds of muscular power. These 24 foot pounds will serve the clock eight days, and unless more power be applied the machinery will stop. The same principle applies to mechanical contrivances of every kind, whether impelled by steam or by sentient bone and muscle. In fact all work is derived from sources of Nature, which in turn have derived their present existence and form from the workings of Nature, or, to be more explicit and exact, from the heat of the sun, which has developed and is developing all the natural laws by which we are surrounded. There is no fear, then, of our getting beyond Nature, nor of machinery of any kind ever adding one iota to the stock of power, latent or active, in Nature's arcana. We may modify and adapt, but we can neither create nor destroy, and may rest assured, therefore, that all discoveries in science and in mechanism will tend eventually to the good of mankind and the glory of the Creator of all things.

New Metals.

In a communication to the Paris Académie des Sciences, read on the 14th of October, M. Delafontaine announced the discovery of the oxide of another new metal, to which he has given the name of Philippium (Pp), in honor of M. Philippe Plantamour, of Geneva, a friend and pupil of Berzelius. M. Delafontaine describes the new element as forming a fourth member of the yttria group of earths. It is yellow, and assuming provisionally that the philippia obtained is in the state of protoxide, its equivalent would be 90 and 95. Its concentrated solution examined with the spectroscope showed a rather broad and very intense magnificent characteristic absorption band in the indigo.

On the 28th of the same month the same gentleman made known to the Academy another new metal, which he calls Decipium, found like yttrium and its cogeners in the samarskite and gadolinite from the United States. At present very little is known about decipium, but its oxide is white, while, as before remarked, that of philippium is yellow. In giving the chemical equivalents of some of these new metals of the same group, such as yttrium, terpium, philippium, and decipium, M. Dumas remarked that chemists find themselves in the presence of new bodies whose series offer some gaps, but if researches are continued we shall soon have more precise and complete data.

Is Science Benevolent?

Faraday had an idea, it is said, that it would be well if the secret of the decomposition of water were not discovered, as the power so gained might not be wisely used; and though the story may be nonsense, any power that, requiring skill and self-restraint for its use, was yet placed in the hands of all men would probably not be beneficial—would certainly not tend to that elevation in comfort which the popular mind permanently expects from science. Imagine the power of firing water discovered, made public from excellent motives, as in a patriotic war, and so becoming the property of a world in which one man in a thousand is probably a crypto-lunatic, anxious, above all things, for a supreme sensation. A discovery, quite possible, of the means of dissolving brick or stone within a definite area into pulp would materially interfere with the security of all property, as would for a time the realization of the Middle Age alchemists' dream. All these discoveries would, of course, to do mischief, require the aid of human malignity, in a consciously malignant state, but others are quite conceivable over which will would have no control. Suppose, for example, Sir G. Airey were to discover that a change had occurred in space, which within, say, a century or two would affect our universe, and inevitably draw the world out of its orbit, thereby pulverizing it to atoms; the effect of that discovery, fatal as it would be to foresight, to patriotism, to that long series of good impulses which have for their unconscious motor the belief that the human race will last, could be nothing but evil. Half the motives to energy and to self-restraint would disappear at once, while the temptation to use up the world, its forests, coal mines, and resources generally, would be enormously exaggerated. Humanity would realize its mortality, and make the best—that is, the worst—of its time. Not one of these suggestions, however, or many other much better ones which might be offered, will come in the least home to the minds of men taught by a few years' experience that science is kind, that knowledge is beneficial, and that every victory over the forces of nature tends to the comfort of man.—*The Spectator.*

The Volatile Oil of Hops.

If steam is passed through hops it carries away a substance which, when condensed, forms an oil that swims on water and has been called hop oil. According to Kühnemann, this oil is not a simple hydrocarbon, but a mixture of a hydrocarbon with several other compounds of oxygen, hydrogen, and carbon. If the so-called hop oil is treated with metallic sodium, the sodium dissolves in the oil without any great evolution of heat, and a substance is produced which is for the greater part soluble in absolute alcohol. If the oil is made from hops that have been treated with sulphur, a strong odor of sulphureted hydrogen is evolved upon the addition of phosphoric or other acids, and can be proved to be such by its reaction with lead test papers. By this reaction sulphured hops can easily be detected. Further researches have shown that this hop oil is a very complicated mixture of a hydrocarbon with oxygen oils. The specific gravity and boiling point of this hydrocarbon is still uncertain, depending upon the purity. The oxygenized bodies separated by sodium have the properties both of alcohols and acids. The product obtained by distillation in vapor of water varies in mixture and composition according to the quality and age of the hops very greatly. Kühnemann is engaged in determining the boiling point, vapor density, and specific gravity of the oxygenized compounds, after which he will make an ultimate analysis to determine their formulas.—*Poly. Notizblatt.*

Toad Poisoning.

The following singular account of the action of toad poisoning on the human body, is reported in the last number of the London *Chemist:*

A child of six years old followed a large toad on a hot summer's day, throwing stones at it. Suddenly he felt that the animal had spurted some moisture into his eye. There suddenly set in a slight pain and spasmodic twitching of the slightly injected eye, but two hours after coma, jumping sight, desire to bite, a dread of food and drink, constipation, abundant urine, great agitation manifested themselves, followed on the sixth day by sickness, apathy, and a kind of stupor, but with a regular pulse. Some days later, having become comparatively quiet, the boy left his bed; his eyes are injected, the skin dry, the pulse free from fever. He howls and behaves himself like a madman, sinks into imbecility and speechlessness, from which condition he never rallies.

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TO INVENTORS.

An experience of more than thirty years, and the preparation of not less than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. In addition to our facilities for preparing drawings and specifications quickly, the applicant can rest assured that his case will be filed in the Patent Office without delay. Every application, in which the fees have been paid, is sent complete—including the model—to the Patent Office the same day the papers are signed at our office, or received by mail, so there is no delay in filing the case, a complaint we often hear from other sources. Another advantage to the inventor in securing his patent through the Scientific American Patent Agency, it insures a special notice of the invention in the SCIENTIFIC AMERICAN, which publication often opens negotiations for the sale of the patent or manufacture of the article. A synopsis of the patent laws in foreign countries may be found on another page, and persons contemplating the securing of patents abroad are invited to write to this office for prices, which have been reduced in accordance with the times, and our perfected facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Jarvis Patent Boiler Setting, same principle as the Siemens process for making steel: burns screenings without blower, and all kinds of waste fuel. A. F. Upton, Agent, 48 Congress St., Boston, Mass.

Valves and Hydrants, warranted to give perfect satisfaction. Chapman Valve Manuf. Co., Boston, Mass.

New York, December 25, 1878. To the patrons of Lubricene: In wishing you the compliments of the season, we believe the most acceptable offering we can make will be lower prices for the coming year. The unprecedented success which has attended the introduction and sale of Lubricene, together with our increased facilities for manufacturing, warrants us in reducing the price, on the 1st January, 1879, to 33c. per lb. on quantities over 100 lbs., and 35c. per lb. on less quantities. We shall also be prepared to furnish Machinery and Cylinder Oils, Gear Grease, etc., at lowest market prices. Thankful for favors of past years, and soliciting a continuance of same, we remain, yours respectfully, R. J. Chard, 134 Maiden Lane.

Wanted.—Partner with $15,000 to $25,000, to take one third to one half interest in an established Mill Machinery and Engine Works located in Central Ohio. Tools, patterns, buildings, and location first-class. A good opening for a good man. Address, with full name and references, Ohio Manufacturer, Box 1059, Mt. Vernon, O.

Wanted.—A Foreman for an Iron Foundry, experienced in fine machinery castings, with references as to energy and ability. Apply to Lock Box 795, Worcester, Mass.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N.J.

The Lambertville Iron Works, Lambertville, N. J., build superior Engines and Boilers at bottom prices.

Empire Gum Core Packing, Soap Stone Packing, Piston Packing; all kinds. Greene, Tweed & Co., 18 Park Place, N. Y.

1,000 2d hand machines for sale. Send stamp for descriptive price list. Forsaith & Co., Manchester, N. H.

Bevins & Co.'s Hydraulic Elevator. Great power, simplicity, safety, economy, durability. 94 Liberty St. N.Y.

Hydraulic Elevators for private houses, hotels, and public buildings. Burdon Iron Works, Brooklyn, N. Y.

Galland & Co.'s improved Hydraulic Elevators. Office 206 Broadway, N.Y., (Evening Post Building, room 22.)

Iron, Brass, and Steel Wire. Needle pointed English Steel Wire, for all purposes. W. Crabb, Newark, N. J.

For Fire or Power Pumps, address the Gould's Manf. Co., Seneca Falls, N. Y., or 15 Park Pl., N. Y. city.

Brush Electric Light.—20 lights from one machine. Latest & best light. Telegraph Supply Co., Cleveland, O.

The Hancock Inspirator received a gold medal at Paris, as being the best boiler feeder ever made, and the Old Colony Railroad (who have twenty-three machines in constant use) have just given it their unqualified indorsement, as the cheapest and most effective feeder ever used on their locomotives. Those interested are referred to their letter of recommendation, which may be found in our advertising columns.

J. C. Hoadley, Consulting Engineer and Mechanical and Scientific Expert, Lawrence, Mass.

The Lathes, Planers, Drills, and other Tools, new and second-hand, of the Wood & Light Machine Company, Worcester, are to be sold out very low by the George Place Machinery Agency, 121 Chambers St., New York.

For the best advertising at lowest prices in Scientific, Mechanical, and other Newspapers, write to E. N. Freshman & Bros., Advertising Agents, 186 W. 4th St., Cin., O.

H. Prentiss & Co., 14 Dey St., N. Y., Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

Presses, Dies, and Tools for working Sheet Metals, etc. Fruit and other Can Tools. Bliss & Williams, Brooklyn, N. Y., and Paris Exposition, 1878.

Rubber Hose, Suction Hose, Steam Hose, and Linen Hose; all sizes. Greene, Tweed & Co., 18 Park Pl., N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

Nickel Plating.—Wenzel's Patent Perforated Carbon Box Anode for holding Grain Nickel. A. C. Wenzel, 114 Center St., New York City.

Bolt Forging Machine & Power Hammers a specialty. Send for circulars. Forsaith & Co., Manchester, N. H.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Manufacturers of Improved Goods who desire to build up a lucrative foreign trade, will do well to insert a well displayed advertisement in the SCIENTIFIC AMERICAN Export Edition. This paper has a very large foreign circulation.

Two fine Astronomical Telescopes, 3 in. and 7 in., by first-class English maker, cheap. I. Ramsden, Phila.

Gold Chronometer Watch, by first-class English maker: cost $260, price $135; latest patented improvements. I. Ramsden, 21 Christian St., Philadelphia, Pa.

Hand Fire Engines, Lift and Force Pumps, for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N.Y., and 73 Liberty St., N. Y. city, U S.A.

For Town and Village use, comb'd Hand Fire Engine & Hose Carriage, $350. Forsaith & Co., Manchester, N. H.

Women's Hospital, 49th St. and 4th Ave., New York, March 6, 1877. H. W. Johns Manufacturing Company, 87 Maiden Lane, New York. Sir:—The Hair Felt Covering, with Asbestos Lining, which you put on the steam pipes and boiler domes of the Women's Hospital, and the Asbestos Cement Felting on the three hot water boilers, are giving great satisfaction, and the result is a great saving of fuel. The temperature of the engine and fire-rooms is very much reduced, so much so, that in cold weather we are rather cold. The saving of coal is 33 1-8 per cent by actual measurement. The Cement Covering is put on in a superior manner, and is the neatest boiler or pipe covering I have yet seen. Respectfully, Duncan McIntyre, Engineer.

Punching Presses, Drop Hammers, and Dies for working Metals, etc. The Stiles & Parker Press Co., Middletown, Conn.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

24 x 48 in. Wright's Automatic Engine, with 16 foot band wheel, 30 in. face, for sale. Price low. Atlas Works, Indianapolis, Ind.

Inventors' Models. John Ruthven, Cincinnati, O.

The Lawrence Engine is the best. See ad. page 29.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Special Planers for Jointing and Surfacing, Band and Scroll Saws, Universal Wood-workers, etc., manufactured by Bentel, Margedant & Co., Hamilton, Ohio.

Boston Blower Co., Boston, Mass. Blowers, Exhaust Fans, Hot Blast Apparatus. All parts interchangeable; material and workmanship warranted the best. Write for particulars.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

Elevators, Freight and Passenger, Shafting, Pulleys, and Hangers. L. S. Graves & Son, Rochester, N. Y.

Holly System of Water Supply and Fire Protection for Cities and Villages. See advertisement in Scientific American of this week.

Diamond Self-clamp Paper Cutter and Bookbinders' Machinery. Howard Iron Works, Buffalo, N. Y.

Mellen, Williams & Co., 57 Kilby St., Boston, Mass. Wiegand Sectional Steam Boiler. Ætna Rocking Grate Bar.

Fine Taps and Dies for Jewelers, Dentists, and Machinists, in cases. Pratt & Whitney Co., Hartford, Conn.

Improved Steel Castings; stiff and durable; as soft and easily worked as wrought iron; tensile strength not less than 65,000 lbs. to sq. in. Circulars free. Pittsburg Steel Casting Company, Pittsburg, Pa.

Sir Henry Halford says Vanity Fair Smoking Tobacco has no equal. Received highest award at Paris, 1878.

Wm. Sellers & Co., Phila., have introduced a new Injector, worked by a single motion of a lever.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St. Wm. Sellers & Co.

The SCIENTIFIC AMERICAN Export Edition is published monthly, about the 15th of each month. Every number comprises most of the plates of the four preceding weekly numbers of the SCIENTIFIC AMERICAN, with other appropriate contents, business announcements, etc. It forms a large and splendid periodical of nearly one hundred quarto pages, each number illustrated with about one hundred engravings. It is a complete record of American progress in the arts.

Notes & Queries

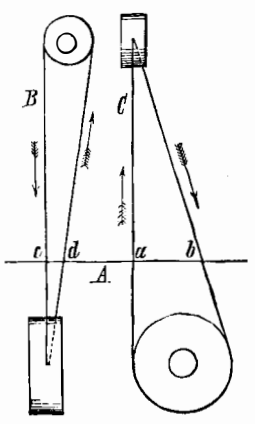
(1) F. H. asks: 1. Does painting the trunk or stem of fruit or shade trees with coal tar harm them? A. Daubing the bark with tar will often kill or seriously injure the tree. It is a common practice, however, to bind the lower part of the trunk, from 10 to 12 inches below the surface of the ground to 3 or 4 feet above, with well dried, tarred paper, to prevent the encroachments of mice and insects. 2. How, and on what part of the grapevine, is grafting or budding done, and which is the easiest and best, also the best time therefor? A. The grapevine may be grafted in the cleft manner if treated as follows: cut the scions during the winter or early spring, keeping them partially buried in a cool damp cellar till wanted. As soon as the leaves of the old vine or stock are fully expanded, and all danger of bleeding is past, cut it off smoothly below the surface of the ground, and split the stock and insert one or two scions in the usual manner, binding the cleft well together if it does not close firmly. Draw the soil carefully over the whole, leaving two or three buds of the scion above the surface. If the root of the stock is a strong native grape, the graft will frequently grow 10 or 15 feet during the first season and yield a fair crop the second year. The vine may also be grafted with good success at the usual season if grafted below the ground, but above ground it should not be attempted, on account of bleeding, until the leaves are nearly expanded. 3. Is it permitted for any person in the United States to make for his own use (strictly), without paying taxes thereon, whisky, wine, or beer, in the same way that we make our own coffee or tea? A. Yes. 4. What is a good book, pamphlet, or paper, treating on insects? A. One of the best works on this subject is "A Treatise on Insects Injurious to Vegetation," by T. W. Harris.

(2) J. R. C. writes: I want to rework stale butter on a large scale, to remove the bad odor and give it a desirable or natural color, if in so doing I will not be under the necessity of using anything injurious to health. A. The following mode of treating rancid butter has been recommended: The butter is first well agitated with hot water, whereby the salt is extracted. On standing it soon separates from the water, when it is again agitated for some time with an equal volume of fresh hot water and a few ounces to the pound of fresh animal charcoal in coarse powder and free from dust. It is freed from charcoal by straining through a fine cloth while still hot, and from the water by the difference in specific gravity. The butter when cold is well washed with fresh milk to which a little sulphite of lime has been added, and then reworked, salted, and colored with a small quantity of annatto. As the latter is not infrequently adulterated with iron oxide and vermilion, it is well to test it for these before using it in butter.

(3) C. D. asks: 1. What is the significance of the picture, which appears in most almanacs, of a man surrounded by the constellations and signs of the zodiac, and lines drawn from the signs to different members of his body? A. It has no significance now. In the days of astrology the several parts of the human body were thought to be influenced by or under the control of the portions of the zodiac designated by the signs with which the members are connected. This with special reference to life, death, health, and disease. 2. What is the best non-conductor of sound? A. A vacuum.

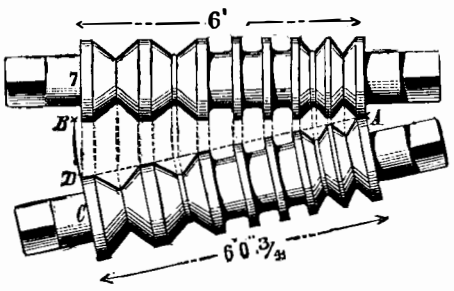
(4) D. V. writes: 1. I have a quantity of chemical writing fluid; have had it two years and it has faded. How can I make it darker? A. You may try the addition of small quantities of tannic acid or extract of nutgalls, and logwood extract. 2. I am in a country place apart from machine shops. How can I draw copper wire No. 22 finer and make my own tools? A. Take a well annealed piece of good tool steel ⅛ inch thick, drill in it several holes of the size of the smallest wire to be drawn, make them all tapering, and enlarge with a reamer so that the holes will vary regularly from the size of No. 22 wire down to that of the smallest wire to be drawn. Harden the plate, polish the holes, reduce the size of the end of the wire, and draw it through the several holes in succession, greasing it before each drawing, and annealing it whenever it becomes stiff. 3. I have made a pair of telephones, mouthpiece as per your engravings, diaphragm of very thin tin. My neighbor wants me to put it up for his use between house and store. Shall I do it, that is, am I infringing on any patent by so doing? A. See "Rights of Investigators" p. 128, volume 39, of the SCIENTIFIC AMERICAN.

(5) A. W. D. asks how to lay out and cut belt holes for a quarter turn belt, said belt to run from one shaft through floor on to another shaft, at right angles with the first, both supposed to be level. A. To make holes through the floors for the belts, lay out on the floor with chalk line and train two views of the pulley, or by scale on paper as shown in the engraving. B is the belt running in the direction of the arrow on the lower pulley, and C is the belt running in the opposite direction. Drop a plumb line representing the perpendiculars, B and C, and draw diagonals governed by the diameters of the pulleys, marking he distances, *a b*, and *c d*, on the floor; now drop a plumb line from each side of the center of face of upper pulley to the floor, and from the point, *c*, thus found, lay off the distance, *a b*, in a line parallel with the upper shaft, and from the point, *a*, in the distance, *c d*, parallel with the lower shaft. These points indicate the places where the holes should be cut.



(6) W. C. H., Jr., asks: 1. How far will a telephone like that described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 142, p. 2260, Fig. 4, carry? A. With a good line, 20 miles. 2. What amount of No. 38 covered wire will give the best results? A. ¾ ounce. 3. How can I make a cheap and simple electric lamp, one or two burners? A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 149.

(7) J. A. C. writes: The following method of laying off the sweep for a pair of rolling mill rolls may be of interest to your readers, the object being to give the proper proportion of shrinkage to each member of the roll pattern. The exact configuration of the roll when finished is laid off on a piece of flat wood, and if the working part of the roll is 6 feet long, as in the sketch, the shrinkage, being usually ⅛ of an inch to a foot, would amount to ¾ of an inch in all; this being the case, a pair of trams are set to 6 feet and ¾ of an inch, and one leg placed at A, and the other at B, and the arc of a circle, B D, described. From the point where this arc intersects a line drawn down from F to C, a



line is drawn to A, making the line, D A, which may represent the edge of the sweep to be made. Similarly with the line, F C, all the other lines which give shape to the roll are brought down until they intersect the line, D A, and on this line are erected the various members of the roll. Now, it follows that if the distance, D A, is the amount of the shrinkage longer than the true length of the finished roll, namely, 6 feet, then every intersection of the line, D A, will be proportionally wider apart on the sweep than on the roll itself; consequently the roll swept up by such a template or sweep will, when cast, be the exact length from each distinctive point to the other, as well as the exact length over all.

(8) C. H. H. asks: 1. How shall I fix a short length—½ inch—of platinum wire between the ends of my battery wires? I wish to heat it. A. Wind it two or three times around each wire, or split the ends of the battery wires, and after inserting the platinum, press the ends together. 2. How many ½ pint bichromate of potash (bottle) batteries will be necessary to heat such a piece of platinum wire? A. If you use a Grenet battery, and a fine platinum, one cell will answer. 3. How can I insulate a brass ring, so that a current can be sent through it without loss to an electro-magnet? A. Glass, sealing wax, rubber, ivory, and hard wood are good insulators. 4. Would it be possible to run a dynamo-electric machine for electric light, by bringing the current from the light back to an engine like Edison's "Harmonic" engine? A. No.

(9) G. H. I. asks: Would heat or sound pass through a vacuum, that is, assuming a perfect vacuum? A. Heat would, sound would not.

(10) E. O. C.—For a definition of sound see p. 347, vol. 39, reply to F. H. P.

(11) M. A. G. asks: 1. What is the meaning of the word anthracite? A. Literally a burning coal stone. 2. Is anthracite coal found in any other place but Pennsylvania? A. Anthracite is found in Pennsylvania, Rhode Island, and South Wales. It is used for the production of iron chiefly in Pennsylvania, Scotland, and Wales. 3. Where was iron first made with anthracite coal, and who was patentee of the process? A. In 1838 and 1839 Thomas made the first experiment on melting iron with anthracite in Pittsville, Pa.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

C. E. B.—It is a shale containing much iron sulphide and a little organic matter.—C. A. R.—No. 1 contains hornblende and tourmaline. No. 2 was not received.—C. & H.—It is a dolerite or trap rock, of little value.—S. L. C.—It is an impure chrysocolla—a silicate of copper. It contains about 9·5 per cent of copper—no silver or gold.

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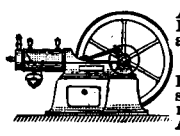

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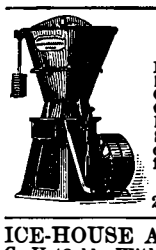

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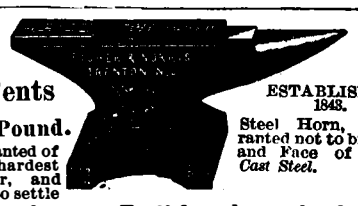

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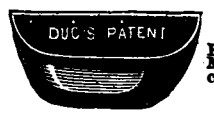

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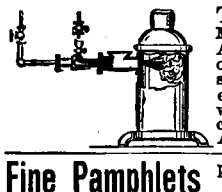

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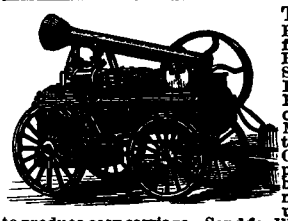

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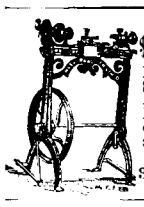

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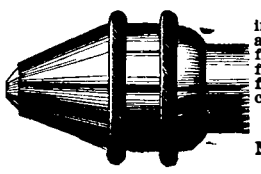

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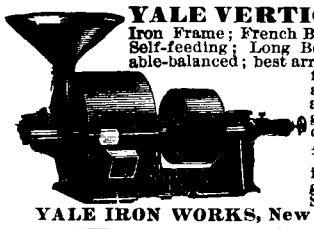

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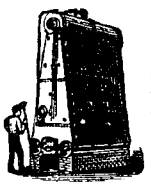

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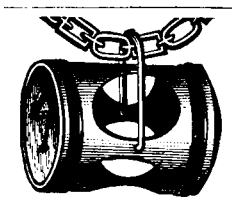

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